Assessment of supply demand balances for petroleum products in Northern India

Prepared for Hindustan Petroleum Corporation Limited, Mumbai

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Table 1 CARG of petroleum product demand (in %)

Product	1991-1998	2000-2011
LPG	10.6	8.1
Naphtha	15.0	3.6
MS	6.4	7.6
ATF	4.4	5.7
SKO	5.6	4.0
HSD	7.3	9.0
FO/LSHS	3.6	4.5

All India demand for petroleum products in 2001/02, 2006/07 and 2011/12 is summarised in table 2.

Table 2 All India demand of select petroleum products: (MMT)

Year	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO*	*Total**
2001/02	8.4	6.87	11.88	2.53	13.47	50.21	14.78	108.14
2006/07	12.22	9.92	12.93	3.31	16.73	75.43	22.86	153.41
2011/12	17.37	14.33	14.41	4.32	20.38	113.32	25.16	209.29

* includes listed seven products only

Two scenarios called 'Base Case' and Alternate Case' have been developed for the refining capacity build up till 2006/07. The 'Base Case' scenario assumes the projected refining capacity as is given in the 'Subgroup report on refining for the IX plan' and 95% of that installed capacity is considered as the refinery throughputs for various refineries till 2006/07 and further till 2011/12. In the 'Alternate Case' scenario, no additional grassroots refinery is considered but only planned low cost expansions of three refineries viz., BPCL, Mumbai; IOC, Koyali and IOC, Haldia. The refinery throughputs in 'Alternate Case' scenario are also taken as 95% of the installed capacity of these refineries. The refining capacity for the period upto 2011/12 (end of Eleventh Five Year Plan) has been assumed to be same as that at the end of Tenth Plan as no fresh proposal are under consideration with Government for new refineries.

Table 3 Yearly region-wise projected refining capacity (MMTPA) -Base case

Region	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	200[illegible]
Northern	13.50	13.50	13.50	13.50	19.50	19.50	[illegible]
Southern	31.69	31.69	37.69	40.69	46.69	46.69	[illegible]
Eastern	14.95	14.95	16.75	16.75	25.75	25.75	[illegible]
Western	51.90	51.90	51.90	51.90	68.40	68.40	[illegible]
All India	**112.04**	**112.04**	**119.84**	**122.84**	**160.34**	**160.34**	[illegible]

Table 4 Yearly region-wise projected refining capacity (MMTPA) -Alternate case

Region	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
Northern	13.50	13.50	13.50	13.50	19.50	19.50	19.50
Southern	31.69	31.69	37.69	40.69	46.69	46.69	46.69
Eastern	14.95	14.95	16.75	16.75	25.75	25.75	29.50
Western	51.90	51.90	57.40	57.40	79.00	79.00	79.00
All India	112.04	112.04	125.34	128.34	170.94	170.94	174.69

The Government has decided to dismantle administered price mechanism in phases. According to the time schedule envisaged by the Government, full deregulation is likely to be completed in 2002. In such a scenario the throughput of the refineries would be governed by the demand and market forces. Presently movement of petroleum product is regulated through the mechanism of SPM where in the movement of petroleum product is governed essentially by demand and not by competitive prices. In a deregulated scenario it is most likely that movement would take place in accordance with market forces. Therefore the cost of the transportation of petroleum product is likely to be a critical input for the refineries.

Furthermore the changes that are likely to occur after complete deregulation in 2002 cannot be fully anticipated. Nonetheless, the following assumptions have been made in this study for projecting the inter-regional product flows and imports:

a) Inter-regional movements will continue to take place subject to market economics
b) The duty structure on petroleum products will be rationalised as per the recommendations of the Expert Technical Group.
c) Surplus product from one region will, in the first instance, move to a deficit region that is logistically best placed to receive the transfer.

Based on the analysis, residual deficits in the country and the northern region, under the two scenarios, are presented in Table 5.

Table 5 Residual deficits in the country and the northern region: Base & Alternate cases (MMT)

Year	*All India*			*Northern Region*			
	Demand	*Supply*	*Deficit*	*Demand*	*Supply*	*Deficit*	*Residual Deficit*
Base Case							
1999/00	94.0	72.7	-18.2	22.5	10.7	-11.8	-7.7
2000/01	100.3	88.7	-11.6	24.2	11.3	-12.8	-5.1
2001/02	108.1	89.0	-19.2	25.9	11.4	-14.5	-7.2
2002/03	117.6	95.0	-22.5	27.8	11.4	-16.4	-9.9
2003/04	127.1	97.3	-29.7	30.3	11.4	-18.9	-13.7

Year	All India			Northern Region			
	Demand	Supply	Deficit	Demand	Supply	Deficit	Residual Deficit
2004/05*	135.3	127.8	-7.5	32.5	16.3	-16.2	-6.5
2005/06	143.9	127.8	-16.2	34.8	16.3	-18.6	-10.1
2006/07	153.4	127.8	-25.7	37.4	16.3	-21.1	-14.1
2011/12	209.3	127.8	-81.5	52.7	16.3	-36.4	-34.6
Alternate case							
1999/00	94.0	72.7	-18.2	22.5	10.7	-11.8	-7.7
2000/01	100.3	88.7	-8.0	24.1	11.3	-12.8	-4.8
2001/02	108.1	89.0	-19.2	25.9	11.4	-14.5	-7.2
2002/03	117.6	99.6	-18.0	27.8	11.4	-16.4	-8.1
2003/04	127.1	101.9	-25.2	30.3	11.4	-18.9	-11.7
2004/05*$	135.3	136.6	1.4	32.5	16.3	-16.2	-2.6
2005/06	143.9	136.6	-7.4	34.8	16.3	-18.6	-6.1
2006/07#	153.4	139.2	-14.2	37.4	16.3	-21.1	-10.1
2011/12	209.3	139.2	-70.1	52.7	16.3	-36.4	-33.4

* Commissioning of refineries at Vadinar, Bina and Paradip; Expansion at Panipat

$ Expansion at BPC, Mumbai

Expansion at Haldia

Note: Demand, supply and deficit numbers are for the seven products considered in this analysis

The above deficit have been estimated with refiners throughput at 95% of the name plate capacity. A few refineries in the past have been operating beyond their rated capacity essentially to meet the demands of petroleum product in the country as mandated in SPM. This was possible as freight cost of movements of petroleum products outside the zones was fully compensated by OCC under the prevailing pricing mechanism. Such cross-country movements may not be economical in a deregulated scenario and thus refineries are likely to operate at capacity according to the demand and market forces. In a deregulated scenario it is highly unlikely that the deficit could be met by higher utilisation of refineries from other regions. Therefore, the deficit may have to be met by either import of petroleum product, if competitive, or by additional refinery capacity.

At the design throughput of 9 MMT, the output of the above mentioned seven products from the Bathinda refinery adds up to 7.8 MMT (as given in DFR). Given the conservative deficit of 10.1 MMT by 2006/07 (Alternate Case), if the refinery is commissioned by 2006/07, still there would be a deficit of 2.3 MMT in the northern region. In such a scenario, this remaining deficit of 2.3 MMT would have to be met either by additional imports at Kandla or through additional refining capacity.

1 Introduction

The government has accorded the approval to HPCL to set up a 9 MMTPA grassroots petroleum refinery at Phulo Khari, Bathinda in the state of Punjab. Facilities proposed to be associated with this project include installation of crude oil terminal (COT), Single Point Mooring (SPM) system and a cross-country pipeline for crude supplies to the refinery. The COT and SPM will be located at Mundra port in Gujarat. The crude pipeline will traverse the states of Gujarat, Rajasthan, Haryana and Punjab.

HPCL has already obtained clearance from the Ministry of Environment for the refinery, 140 MW captive power plant, single point mooring and crude oil pipeline between Mundra and Bathinda. Earlier, HPCL proposed to implement the project through a Joint Venture (JV) company.

In 1997, HPCL received the first stage approval of Government of India for preparation of Detailed Feasibility Report (DFR) for 6 MMTPA refinery. Keeping in view the growing demand of petroleum products and large scale deficits estimated in the Northern region, the DFR was submitted by the company for the stage II investment approval for a refinery capacity of 9 MMTPA in November 1998. The DFR, inter-alia, contained the market analysis in terms of demand and supply projections for petroleum products. The product surplus/deficit projections for all India and Northern region in specific were also covered. Meanwhile a few refineries have expended their capacities. Besides, Reliance refinery has also been commissioned. Due to these developments, data on product balances may require updation.

With this background, HPCL have commissioned TERI to undertake a quick study on re-assessment of the demand supply balance for major petroleum products in India. The objective of this study is to update projections of demand and supply made in the DFR, based on actual data available and revise the supply-demand balance for the petroleum products as given in the DFR.

Specifically, the terms of reference for the study are as follows:

1. Estimation of supply-demand balance for seven major products namely, MS, HSD, Furnace oil/LSHS, Naphtha, Kerosene, LPG and ATF, as these products constitute about 93% the total requirement of petroleum products.
2. Analyse data for the Northern region, i.e., the states of Punjab, Haryana, Delhi, West Uttar Pradesh, Rajasthan, Jammu & Kashmir and Himachal Pradesh;
3. Projections for demand and supply with the balance to be covered till the end of X and XI plans. The year wise data with respect to projections for products to be done at the state level in the Northern region till 2006/07 only and thereafter an aggregate figure for 2011/12 to be provided.

For the purpose of this report, India has been divided into 4 regions each including a number of states. These regions are:

- Northern region
- Western region
- Eastern region (including North-Eastern region)
- Southern region

where, the Northern region covers Punjab, Haryana, Delhi, Rajasthan, Jammu & Kashmir, Himachal Pradesh and West Uttar Pradesh. The report provides estimates for all India and further for the four regions. In the Northern region, state wise details are provided.

Product balances are estimated in the two scenarios called 'Base Case' and Alternate Case'. The two scenarios are developed for the refining capacity build up till 2006/07. The 'Base Case' scenario assumes the projected refining capacity as is given in the 'Subgroup report on refining for the IX plan' and 95% of that installed capacity is considered as the refinery throughputs for various refineries till 2006/07 and further till 2011/12. In the 'Alternate Case' scenario, no additional grassroots refinery is considered but only planned low cost expansions of three refineries. The refinery throughputs in 'Alternate Case' scenario are also taken as 95% of the installed capacity of these refineries. However, it may be noted that some of the Indian refineries for quite sometime have been operating at more than their rated capacities, to meet the overall demand in the country.

The demand estimates for major petroleum products are given in Chapter 2 till the end of XIth Five Year Plan. A brief methodology followed to determine the product demand is also given. Chapter 3 discusses the likely refining capacity build up till 2011/12 in the country. The demand supply balances for major products are assessed in detail for all-India and for the Northern Region statewise in Chapter 4. The year-wise supply demand balances are provided in the Annexures attached at the end of Chapter 4.

2 Demand projections

Demand projections for petroleum products, in this analysis, pertain to liquefied petroleum gas (LPG), naphtha, motor spirit (MS), aviation turbine fuel (ATF), superior kerosene oil (SKO), high speed diesel (HSD) and furnace oil/low sulphur heavy stock (FO/LSHS). In 1998/99, these accounted for about 93% of the total petroleum products sold in the country. The projection period constitutes 1999/00 to 2011/12. Projections presented in the subsequent sections indicate unconstrained demand, i.e., these ignore supply/logistics and administrative constraints, etc.

Liquefied petroleum gas (LPG)

LPG is primarily used as a domestic fuel with limited usage in industrial/commercial sectors. Demand projections for LPG have, thus, been separately modelled for domestic and industrial/commercial sectors. Recently the government allowed use of LPG as a fuel for automobiles. However, amendments to various acts like the Motor Vehicles Act is still pending. In addition, retailers have cited problems regarding arrangements for dispensing this product. At this juncture, LPG demand for automotive use has been ignored in this analysis.

Domestic demand

Demand for LPG for domestic use has been estimated from a demographic model that essentially computes the number of potential LPG consumers at a given point in time, which in conjunction with the figure for LPG requirement per household yields the total demand for LPG at that point of time.

On account of the variations in consumer demographics across the country, the analysis was carried out a state level and the results were pooled together to arrive at national level estimates for LPG demand.

Data on consumer expenditure patterns was sourced from results of National Sample Survey Organisation (NSSO) rounds on consumer expenditure. The NSSO data categorises state populations into fractile classes (accounting for 10% of the populations each) in ascending order of Monthly Per Capita Expenditure (MPCE). These are available separately for urban and rural areas.

Consumer expenditure tabulated as MPCE, is further sub-categorised into twenty different categories, which includes amongst others, the expenditure on fuel and light.

In order to estimate the potential consumers for LPG, MPCE on cooking fuels alone was isolated from the components of the fuel and light expenditure. Based on the prevailing LPG price and LPG consumption per capita, per capita cost of LPG usage was estimated. A person was considered to be a potential consumer if his target cooking expenditure exceeded the cost of using LPG. The aggregate of all such potential consumers indicated the potential LPG consumer population. The product of the potential consumer population and LPG consumption per capita yielded the potential demand for LPG for domestic use.

Industrial/commercial demand

Out of the total industrial and commercial folio, three sectors, namely, hotels & restaurants, chemicals (including petrochemicals, fertilisers, pesticides, other organic chemicals) and industries such as glass, ceramics, rubber tyres, plastics etc account for over 70% of total LPG bulk consumption.

Demand projections were related to the expected performance of the industrial sector as a whole. The value added from the manufacturing sector was considered to be a good proxy indicator for industrial performance. Assuming that the overall GDP grows at an annual rate of 6.5% during the projection period, the value added from the industrial sector is expected to grow at about 8% per annum.

Industrial/commercial LPG sales are highly localised. Six industrial regions viz., Vadodara (Gujarat), Ernakulam (Kerala), Vishakhapatnam (Andhra Pradesh) and Mumbai, Thane & Pune (all in Maharashtra), together account for 57% of the LPG industrial consumption. In this respect, the LPG industrial/commercial demand pattern is highly skewed at present. Thus, national level estimates of the industrial/commercial LPG demand were pooled from state level estimates.

Projections of industrial LPG demand in a state were linked to the projected growth in the value added by the industrial sector in a state. Estimates of industrial value added in a state were, in turn, derived from estimates of growth in value added from the manufacturing sector at the national level.

Aggregate LPG demand

LPG demand in the country grew at an annual rate of 10.6% during the period 1991/92-1998/99. The aggregate LPG demand potential is expected to grow at

an annual rate of 8.1% during the forecast period. While the demand growth in the industrial/commercial sector at 13.5% p.a. exceeds that in the domestic segment at 7.6%, the demand from the industrial/commercial segment accounts for only 14% of the total potential in 2011/12. The results are summarised in Table 2.1.

Table 2.1 Projected aggregate LPG demand (TMT)

Year	*Demand Potential*		
	Domestic	*Industrial/ Commercial*	*Total*
1998/99*	5998	461	6459
1999/00	6622	509	7131
2000/01	7190	573	7763
2001/02	7765	645	8410
2002/03	8325	729	9054
2003/04	8916	825	9742
2004/05	9611	937	10548
2005/06	10220	1061	11281
2006/07	11020	1205	12225
2011/12	15045	2321	17366

* Estimated potential

Naphtha

The demand for naphtha is primarily restricted to large-scale petrochemical and fertiliser plants. Proposed fertiliser plants expected to come up during the projection period will have dual fuel facilities in most cases and thus can run on either natural gas or naphtha. However, current production of domestic gas is fully allocated. Demand for additional gas, thus, would have to be met through imports. Although pipeline imports are preferable, the proposals for gas import by pipeline are in nascent stages, and a number of proposals for LNG imports are at various stages of development. However, bulk of the demand for naphtha arises from the petrochemicals sector which cannot use LNG as a feedstock as it primarily consists of methane whereas petrochemical industries require higher order carbon fractions.

Earlier the Government had announced the liquid fuel policy that encouraged the private sector to set up naphtha based power projects throughout the country. A total of 12,000 MW of generating capacity was envisaged under the policy. However, on account of the volatility in naphtha prices and the associated volatility in generation costs, lack of guarantees/escrow cover by state governments/SEBs, etc. most of these projects are likely to be further delayed. As it is not possible at this stage to anticipate

which projects will materialise, a flat and low annual growth rate of 3% has been applied to the sales by public sector (PSU) oil companies.

While naphtha is primarily sold by the public sector (PSUs) oil companies, some amount is also imported by private parties, bulk of which is accounted for by Reliance Industries for their petrochemical plant at Hazira, Gujarat. In 1998/99, total naphtha imports by private parties aggregated 2.2 million tonnes It is expected that imports by Reliance are likely to be substituted by domestic naphtha production from RPL's refinery at Jamnagar, Gujarat. For the projection period, thus, naphtha demand for Reliance Industries has been taken equivalent to the output of RPL's refinery (2236 TMT p.a.).

Further in 1999/00, the first phase of the 2450 MW power plant at Dabhol was commissioned. The 826 MW unit is currently running on imported naphtha and is expected to switch over to LNG by 2002/03. Naphtha demand for the Dabhol power plant is, thus, expected to be in the short run only.

In addition, the 650,000 TPA petrochemical plant at Haldia was commissioned in April 2000. Naphtha demand is expected to stabilise to about 1500 TMT from the current 400 TMT.

Demand for naphtha grew at an annual rate of 15% during the period 1991/92 till 1999. Demand growth has been particularly high in the recent years. However, with limited naphtha based projects expected to materialise in the projection period, naphtha demand is expected to grow at an annual rate of 3.6%. Naphtha demand projections are summarised in Table 2.2.

Table 2.2 Projected demand for naphtha (TMT)

Year	*Demand*
1998/99*	9221
1999/00*	10717
2000/01	11354
2001/02	11988
2002/03	12928
2003/04	12254
2004/05	12509
2005/06	12773
2006/07	13044
2011/12	14526

* Actual sales

Motor spirit

The demand for motor spirit is restricted to the transport sector, in that too, primarily to personalised modes of transport, i.e., cars and two wheelers and inter-mediate transportation modes like taxis and three-wheelers. The demand

for MS thus depends upon vehicle populations of the above mentioned categories.

Trends in vehicle populations for personalised modes of transportation were analysed. These indicated a strong correlation with per capita income levels. Projections for vehicle populations of personalised modes of transport were thus regressed from per capita income levels.

The consumption of MS increased at an annual rate of 6.4% during the period 1991/92-1998/99. Based on the above analysis, the population of personalised modes of transport is projected to grow at an annual rate of 7.6% during the projection period. The same growth rate has been used to project MS demand during the projection period. The results are presented in Table 2.3.

Table 2.3 Projected demand for motor spirit (TMT)

Year	*Demand*
1998/99*	5507
1999/00	5927
2000/01	6380
2001/02	6867
2002/03	7392
2003/04	7956
2004/05	8563
2005/06	9217
2006/07	9921
2011/12	14333

* Actual sales

Aviation turbine fuel (ATF)

The demand for ATF is dependent upon the level of utilisation of air transport services in the country. Air transport services can be broadly categorised under domestic/international operations and the defence services. While the fuel for domestic air services is sourced indigenously, international carriers operating to/from India uplift fuel from most economical sources. Demand for ATF has thus been separately assessed for domestic and international airlines. No assessment has been carried out for ATF sales to the defence forces. Presently, sales to defence forces account for about 20% of the total ATF sales. A similar proportion has been assumed for the projection period.

ATF demand: domestic airlines

The Indian civil aviation sector is characterised by limited dedicated cargo operations. The projections, thus, have been restricted to those for domestic

passenger traffic and assumed to be representative of the total domestic air traffic.

It is estimated that business traffic (including that from the Government) accounts for about 70% of the total air traffic, followed by foreign tourists in India accounting for another 20% and non-resident Indians visiting India accounting for about 7% of the total domestic traffic. Leisure/emergency travel accounts for a marginal 3% of the total traffic only.

Given the demand structure for air traffic, key variables likely to impact the demand for air travel were identified. These include Gross Domestic Product (GDP) & it's sectoral components, the Index of Industrial Production (IIP), Foreign tourist arrivals (FTA), Foreign direct investments (FDI), and ticket prices.

The causal variables identified were used for regression analysis and estimates were developed for likely demand for air transport services. Air traffic demand was derived from an annual growth rate of 6.5% in the GDP.

However, at the same time, it was felt that the past is not fully representative of the future. An international cross-sectional analysis of air travel utilisation at different developmental levels was carried out to estimate the likely demand for air travel in the country. The impact of a higher growth from this analysis was factored into air traffic projections estimated from the above-mentioned econometric modelling.

Demand for ATF for domestic operations was subsequently estimated by regressing ATF consumption by domestic airlines against domestic air traffic.

ATF demand: international airlines

International air traffic is influenced by a variety of exogenous variables including inter-governmental relations. A substantial portion of the outbound traffic comprises of Indians seeking employment abroad. The immigration policies of target destinations like USA, UK and the countries in the Gulf, thus, influences the level of outbound traffic.

It is difficult to abstract a representative mathematical formula that captures these externalities. Thus, an industry survey was conducted and views were sought on the likely growth of traffic in this segment.

Estimates of growth in international traffic in the next few years vary from those as high as 20% per annum (Air France) to more moderate levels of 8-10% (Lufthansa).

Given the fact that international traffic has been growing at an annual rate of 7% in the past, a 10% growth in international air traffic was assumed for

the projection period. ATF demand for international airlines was subsequently estimated by regressing ATF consumption in this sector against international air traffic.

ATF demand increased at an annual rate of 4.4% during the period 1991/92 – 1998/99. The aggregate ATF demand, from domestic as well as international air traffic, is expected to grow at about 5.7% during the projection period. The results are summarised in Table 2.4.

Table 2.4 Projected demand for ATF (TMT)

Year	*Demand*
1998/99*	2112
1999/00	2279
2000/01	2404
2001/02	2534
2002/03	2672
2003/04	2818
2004/05	2972
2005/06	3134
2006/07	3305
2011/12	4316

* Actual sales

Superior kerosene oil (SKO)

The demand for Kerosene is primarily restricted to the domestic sector. Results of the latest NSSO Round (50th) indicate that 62% of the rural households use Kerosene as a primary fuel for lighting. This is on account of the fact that while substantial progress has been made on the rural electrification front, actual power availability is limited. Households, thus, still have to rely on Kerosene for lighting purposes.

Kerosene use for cooking is negligible in rural areas. In urban areas, 23% of the households use Kerosene as a primary fuel for cooking. However, subject to increase in LPG availability in, the reliance on Kerosene in cooking areas may come down in the future.

For projecting the demand for Kerosene, trends in per capita availability of Kerosene were analysed. Kerosene consumption has increased from 9.7 kg/capita in 1991/92 to 12.7 kg/capita in 1998/99. These trends were extrapolated for the projection period as well.

Kerosene demand was subsequently estimated as the product of Kerosene consumption per capita and the projected population. The results are summarised in Table 2.5.

Table 2.5 Projected demand for Kerosene (TMT)

Year	Demand
1998/99*	12243
1999/00	12471
2000/01	12866
2001/02	13468
2002/03	14080
2003/04	14714
2004/05	15368
2005/06	16042
2006/07	16734
2011/12	20378

* Actual sales

Kerosene demand grew at an annual rate of 5.6% during the period 1991/92 – 1998/99. A growth of 4% per annum is envisaged during the projection period.

High speed diesel (HSD)

HSD sales account for about 40% of the total petroleum product sales in the country. HSD has wide usage in different sectors including transport, agriculture and industries.

HSD sales structure includes both direct and retail sales. Direct sales include those to industrial consumers, food processing units, state road transport undertakings (SRTUs), aviation, shipping and railways. However, together these account for only 25% of the total sales. Bulk of sales are accounted for by the retail trade.

However, limited data is available on the structure of the retail trade. Projections of HSD use in agriculture, for instance, would be based on a number of variables including number of pumpsets in operation, hours of use, efficiency of pumpsets, water table depths, usage patterns of tractors etc. On account of limitations in availability of appropriate data, a trend analysis in HSD sales was undertaken. The analysis indicated a strong correlation with the growth in value added in the economy. Projections for HSD were thus based by regressing HSD demand against GDP which has been assumed to grow at an annual rate of 6.5% during the projection period.

HSD sales increase at an annual rate of 7.3% during the period 1991/92 – 1998/99. The aggregate demand for HSD is summarised in Table 2.6. The demand for HSD is expected to grow at an annual rate of 9% during the projection period.

Table 2.6 Projected demand for HSD (TMT)

Year	Demand
1998/99*	37217
1999/00	42664
2000/01	46282
2001/02	50207
2002/03	54465
2003/04	59085
2004/05	64095
2005/06	69531
2006/07	75428
2011/12	113318

* Actual sales

Furnace oil (FO)/LSHS

The demand for furnace oil/LSHS is accounted for by three broad categories, i.e., power, fertilisers and general trade. FO/LSHS sales under general trade to industries presently account for about half of the total FO/LSHS sales.

FO/LSHS use for power generation is primarily concentrated in the western region of the country. The two bulk consumers in the west are Gujarat Electricity Board's fuel oil based plant at Dhuvaran and Tata Electric Company's plant in Mumbai. In addition, a number of proposals for FO based power plants integrated with existing refineries/ refinery expansions are in the offing. The commissioning of these has been related to scheduled expansions/additions to refining capacity.

FO/LSHS demand for fertiliser production is primarily concentrated in the northern region on account of NFL's fuel oil based plants at Nangal, Bathinda and Panipat. Other major consumers include FCI's plant at Sindri in the East, GNFC in the West and SPIC and FACT in the southern region. No new fuel oil based fertiliser plant is envisaged during the projection period.

Fuel oil demand under general industrial trade was co-related with the level of industrial activity in the country. The value added from industrial sector is expected to grow at an annual rate of 8% during the projection period given that the GDP is expected to grow at an annual rate of 6.5%.

The aggregate demand for furnace oil/LSHS is expected to grow at an annual rate of 3.6% during the projection period, as against 4.5% during the period 1991/92 – 1998/99. The results are summarised in Table 2.7.

able 2.7 Projected demand for FO/LSHS (TMT)

ear	Demand
998/99*	.12511
.999/00*	12846
2000/01	13378
2001/02	14777
2002/03	17087
2003/04	20611
2004/05	21328
2005/06	22078
2006/07	22864
2011/12	25164

* Actual sales

Regional demand

The regional demand for the above mentioned petroleum products (except naphtha and furnace oil) has been estimated on the basis of the proportionate share of each region's sales in the total sales of each product in 1998/99. Further, the demand for petroleum products in each state has also been estimated in proportion to the state's share of sales to the total sales in the region in the base year (1998/99). For naphtha, while the PSU sales in the projection period follow a similar distribution pattern as in 1998/99, additional demand has been assessed specific to the locations of the petrochemical/power plants. Similarly, incremental demand for furnace oil from integrated refinery power plants is region specific.

The northern region comprises the states of Jammu & Kashmir, Punjab, Haryana, Himachal Pradesh, Delhi, Rajasthan, the Union Territory of Chandigarh, and Western U.P. (districts north west of the peripheries of the districts of Bahraich, Sitapur, Hardol, Auriya, Jalaun , Jhansi and Lalitpur) while Eastern U.P has been clubbed with Eastern region.

The division of U.P is in line with the product distribution pattern in the north. IOC's refinery at Mathura supplies products to the western parts of the state of Uttar Pradesh and the rest of the northern region. Likewise, the eastern parts of Uttar Pradesh are fed from refineries at Baruani and Haldia in the east.

Under the above-mentioned assumptions, regional demand for petroleum products in 2001/02, 2006/07 and 2011/12 is summarised in Tables 2.8, 2.9 and 2.10.

Table 2.8 Regional demand of select petroleum products: 2001/02 (TMT)

Year	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO*	*Total**
Punjab	376	482	61	77	464	2987	1111	5556
Haryana	288	217	0	30	228	2324	594	3680
Delhi	653	645	0	669	296	1619	133	4014
Rajasthan	336	293	333	56	563	3480	373	5433
Jammu & Kashmir	79	73	0	22	174	297	27	672
Himachal Pradesh	83	41	0	0	65	320	30	539
Chandigarh	41	69	0	31	24	96	24	287
Uttar Pradesh -West	598	287	324	45	805	3189	473	5720
Northern Region	2453	2106	718	930	2617	14311	2766	25900
Southern Region	2071	1820	1915	462	2857	13460	3658	26242
Eastern Region	1461	961	2307	319	4016	9456	1647	20167
Western Region	2425	1981	6937	824	3977	12981	6706	35831
Total	8410	6867	11876	2534	13468	50207	14777	108140

* Reflects the sum of the listed seven products only

Northern Region: Comprises of the states of Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh (West) & the Union territory of Chandigarh
Southern Region: Comprises of the states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and the Andaman & Nicobar Islands
Eastern Region: Comprises of the states of Uttar Pradesh (East), Orissa, Bihar, West Bengal and the North Eastern States of Arunachal Pradesh, Assam, Manipur, Meghalya, Mizoram, Nagaland, Sikkim and Tripura.
Western Region: Comprises of the states of Goa, Gujarat, Madhya Pradesh and Maharashtra.

Table 2.9 Regional demand of select petroleum products: 2006/07 (TMT)

Year	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO*	*Total**
Punjab	546	696	71	100	576	4487	1872	8348
Haryana	418	313	0	39	283	3491	747	5292
Delhi	949	931	0	872	368	2432	167	5719
Rajasthan	489	423	385	73	699	5228	470	7766
Jammu & Kashmir	115	106	0	28	216	446	34	945
Himachal Pradesh	120	60	0	0	80	481	38	779
Chandigarh	60	100	0	41	30	144	31	406
Uttar Pradesh -West	869	414	376	58	1000	4790	596	8103
Northern Region	3566	3042	832	1212	3252	21499	3954	37358
Southern Region	3011	2629	2220	602	3550	20221	7046	39278
Eastern Region	2124	1389	3247	416	4990	14206	2073	28444
Western Region	3525	2861	6634	1075	4942	19502	9791	48329
Total	12225	9921	12932	3305	16734	75428	22864	153409

* Reflects the sum of the listed seven products only

Table 2.10Regional demand of select petroleum products: 2011/12 (TMT)

Year	LPG	MS	Naphtha	ATF	SKO	HSD	FO	Total*
Punjab	776	1005	82	131	702	6741	2056	11492
Haryana	594	452	0	51	344	5245	846	7533
Delhi	1348	1345	0	1139	448	3654	189	8123
Rajasthan	694	611	447	95	851	7854	532	11083
Jammu & Kashmir	163	153	0	37	263	669	39	1324
Himachal Pradesh	170	86	0	0	98	723	43	1120
Chandigarh	86	145	0	53	37	216	35	572
Uttar Pradesh -West	1234	598	435	76	1217	7197	674	11432
Northern Region	5065	4395	964	1583	3960	32299	4412	52679
Southern Region	4276	3798	2573	786	4323	30378	7651	53786
Eastern Region	3017	2006	3525	543	6077	21341	2345	38854
Western Region	5007	4134	7352	1404	6018	29299	10756	63969
Total	17366	14333	14414	4316	20378	113318	25164	209289

* Reflects the sum of the listed seven products only

Clearly, the western region leads the other regions in terms of the aggregate demand for petroleum products. Demand in the north closely trails the demand in the southern region. Within the northern region, demand is highest in the western part of Uttar Pradesh, followed by Rajasthan.

Further, HSD sales continue to dominate the demand for petroleum products in the country and in the northern region.

It may be noted here that as per the recent Hydrocarbon Vision 2025, the total demand for petroleum products in 2006/07 is expected to be about 148 MMT, wherein gas imports of the order of 15 MMTPA of LNG have been considered. The report also evaluates the demand for petroleum products in a scenario wherein these imports do not fructify by 2006/07. In such a situation, the total demand for petroleum products in 2006/07 is expected to be 179 MMT.

3 Refining capacity

Present refining capacity

In 1999/00 the 17 Indian refineries had a combined throughput of about 86 million tonnes of crude. All refineries are public sector units except Mangalore refinery, which is under the joint sector and Reliance refinery, which is owned by the private sector. In 1999/00 two new refineries were commissioned, the Numaligarh refinery in Assam and the Reliance refinery in Gujarat. While, the 27 MMTPA Reliance refinery's crude throughput was 11.7 MMT, Numaligarh refinery operated for only one month during March 2000 at a crude throughput of 205 TMT.

There has been also some increase in refining capacity during 1999/00 compared to the previous year through expansion and de-bottlenecking of existing refineries. Table 3.1 lists the refinery crude throughput against the installed capacity of different refineries in 1999/00.

Table 3.1 Installed capacity and refinery throughputs in 1999/00 (MMT)

Refinery	Installed Capacity	Refining Throughput
Northern Region		
IOC, Mathura	7.50	8.13
IOC, Panipat	6.00	4.15
Southern Region		
MRL, Madras	6.50	6.38
CRL, Cochin	7.50	7.83
HPCL, Vishakh	4.50	4.62
MRL, Narimanam	0.50	0.64
MRPL, Mangalore	9.69	5.20
Eastern Region		
IOC, Barauni	4.20	3.41
IOC, Haldia	3.75	4.10
IOC, Guwahati	1.00	0.91
IOC, Digboi	0.65	0.60
BRPL, Bongaigaon	2.35	1.91
NRL, Numaligarh	3.00	0.20
Western Region		
BPCL, Mumbai	6.90	8.90
HPCL, Mumbai	5.50	6.02
IOC, Koyali	12.50	11.11
Reliance, Sikka	27.00	11.67
Total	109.04	85.79

In 1999/00, all-India indigenous refining production of about 74 MMT was inadequate to meet the petroleum product demand of about 95 MMT.
In this study, the future availability of petroleum products in the country is estimated based on addition of new refining capacity and expansion of existing refineries. Two scenarios called 'Base Case' and Alternate Case' have been developed for the refining capacity build up till 2006/07.

The 'Base Case' scenario assumes the projected refining capacity as is given in the 'Subgroup report on refining for the IX plan' and 95% of that installed capacity is considered as the refinery throughputs for various refineries till 2006/07 and further till 2011/12. In the 'Alternate Case' scenario, no additional grassroots refinery is considered but only the expansions of three refineries viz., BPCL, Mumbai; IOC, Koyali and IOC, Haldia. The refinery throughputs in 'Alternate Case' scenario are also taken as 95% of the installed capacity of these refineries. However, some of the Indian refineries for quite some time have been operating at more than their rated name plate capacities.

Expansions/additions to refining capacity beyond 2006/07 (terminal year of Tenth Five Year Plan) are not known. The refining capacity for the period upto 2011/12 (end of Eleventh Five Year Plan) has thus been assumed to be same as that at the end of Tenth Plan. The gap between this capacity and the increasing demand (Chapter 2) will serve as a guide for planning the feasibility of additional refinery capacity in the country beyond 2006/07.

The LPG availability from natural gas has been included in LPG production estimates as more than 50% of the LPG production presently comes from natural gas fractionators at Uran, Hazira and Lakwa and on the Hazira-Bijaipur-Jagdishpur (HBJ) natural gas pipeline of GAIL.

Expansion of existing refineries

Since expansion of existing refinery units offers a low cost option as compared to putting up grass roots refineries, the expansion proposals will find easier acceptance and their materialisation will be quicker. Expansion proposals under the Base Case and Alternate Case scenarios are summarised in Table 3.2 and 3.3 along with the timing of their materialisation.

Table 3.2 Materialisation of refinery expansion proposals-Base Case

Refinery	Installed capacity (MMTPA)			
	Existing	Expanded	Addition	Year
Northern Region				
IOC, Panipat	6.00	12.00	6.00	2004/05
Southern Region				
MRL, Madras	6.50	9.50	3.00	2003/04
HPCL, Vishakh	4.50	7.50	3.00	2000/01
CRL, Cochin	7.50	13.50	6.00	2004/05
Eastern Region				
IOC, Barauni	4.20	6.00	1.80	2002/03
Total			19.80	

*HPCL's Punjab Refinery Project is not included.

Table 3.3 Materialisation of refinery expansion proposals-Alternate Case

Refinery	Installed capacity (MMTPA)			
	Existing	Expanded	Addition	Year
Northern Region				
IOC, Panipat	6.00	12.00	6.00	2004/05
Southern Region				
MRL, Madras	6.50	9.50	3.00	2003/04
HPCL, Vishakh	4.50	7.50	3.00	2000/01
CRL, Cochin	7.50	13.50	6.00	2004/05
Eastern Region				
IOC, Barauni	4.20	6.00	1.80	2002/03
IOC, Haldia @	3.75	7.50	3.75	2006/07
Western Region				
BPCL, Mumbai@	6.90	12.00	5.10	2004/05
IOC, Koyali @	12.50	18.00	5.50	2002/03
Total			34.15	

*HPCL's Punjab Refinery Project is not included.

@increase over base case

New refineries

To encourage investment in refining capacity, the Indian government in 1985 allowed investment by the private sector in refining by promoting formation of joint venture (JV) companies for setting up new refineries, with the public sector company and the joint venture partner each holding 26% of the equity and the balance being offered to financial institutions and the general public.

Since then the letters of intent have been issued by the Government to a number of joint venture and private sector companies for putting up new refineries. Subsequent delicensing of the refinery sector took place in 1997.

On the basis of the latest information available and a review of the progress made on the new projects, an indication of the earliest possible year of commissioning of each new refinery has been ascertained. It is estimated that refining capacity is likely to be increased to 160.34 MMTPA under the 'base case' and 174.69 MMTPA under the 'alternate case' by 2006/07. It may be noted that the actual refinery throughput in a given year may be less than the rated capacity. Expected throughputs of new refineries are summarised in Table 3.4.

Table 3.4 Expected throughputs of new refineries (MMTPA)

Refinery	*2002/03*	*2003/04*	*2004/05*	*2005/06*
Southern Region				
NFCL, Cuddalore	6.00	6.00	6.00	6.00
Eastern Region				
IOC, Paradeep			9.00	9.00
Western Region				
Essar, Vadinar			10.50	10.5
BPCL, Bina			6.00	6.00
Total	6.00	6.00	31.50	31.50

*HPCL's Punjab Refinery Project is not included.

The latest status of the above few refinery proposals is as follows:

Bina

Various approvals for construction of Bharat-Oman refinery at Bina are in hand. Land has been acquired and all necessary clearances for the project including the environment clearance have been granted. The project had also received the no-objection certificate from the state pollution control board for Crude oil Terminal (COT) in 1995. However, the commencement of work got delayed for over two years in the wake of delays in various clearances from the state and central agencies.

Paradeep

While the initial capacity of the IOC refinery was planned at 9 MMTPA, this has now been increased to 12 MMTPA. The Joint Venture partner, Kuwait Petroleum Corporation has withdrawn from the project, but another multinational oil major has evinced interest to participate as a JV partner. Steps are simultaneously being taken to obtain various clearances.

Vadinar

Work on the 10.5 MMTPA Essar refinery project was virtually at a standstill for the last few months due to paucity of funds after 67% of the work like procuring the equipment etc. was completed. Indian financial institutions and banks are now working on the financial restructuring of the project.

Increase in refining capacity/product availability

Resulting from commissioning of new refineries and refinery expansions, the cumulative refining capacity of domestic refineries will increase as follows under two scenarios:

Base case

112.04 MMTPA by the year 2001/02
160.34 MMTPA by the year 2006/07
160.34 MMTPA by the year 2011/12

Alternate case

112.04 MMTPA by the year 2001/02
174.69 MMTPA by the year 2006/07
174.69 MMTPA by the year 2011/12

The years 2001/02, 2006/07 and 2011/12 represent the terminal years of the IX, X and XI Five Year Plans. As there are currently no proposals for additional refining capacity beyond 2006/07, the capacity planned upto that year which is 160.34 MMTPA under the 'Base Case' and 174.69 MMTPA under the 'Alternate case', have been maintained through to 2011/12.

Report of the group on India, hydrocarbon-2025 assumes the refining capacity as 129MMTPA by 2001/2 and 167 MMTPA by 2006/07 in the country.

Annexure 3.1 and 3.2 provides a statement on the progressive increase in the capacities of the existing and new refineries to the year 2006/07. The two scenarios do not take the Punjab refinery project into consideration whose proposed capacity is to be assessed against the supply demand balances in Chapter 4. The individual product yield patterns are applied to each of the refineries to estimate the forward availability of specified products, viz. LPG, naphtha, gasoline, kerosene, ATF, HSD and fuel oil. These are reported in Chapter 4.

Table 3.5 Yearly region-wise projected refining capacity (MMTPA) -Base case

Region	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Northern	13.50	13.50	13.50	13.50	19.50	19.50
Southern	31.69	31.69	37.69	40.69	46.69	46.69
Eastern	14.95	14.95	16.75	16.75	25.75	25.75
Western	51.90	51.90	51.90	51.90	68.40	68.40
All India	**112.04**	**112.04**	**119.84**	**122.84**	**160.34**	**160.34**

Table 3.6 Yearly region-wise projected refining capacity (MMTPA) -Alternate case

Region	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Northern	13.50	13.50	13.50	13.50	19.50	19.50
Southern	31.69	31.69	37.69	40.69	46.69	46.69
Eastern	14.95	14.95	16.75	16.75	25.75	25.75
Western	51.90	51.90	57.40	57.40	79.00	79.00
All India	**112.04**	**112.04**	**125.34**	**128.34**	**170.94**	**170.94**

Annexure 3.1

Expected installed capacity of refineries (MMTPA)-Base case

Refinery	*2000/01*	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*
Northern Region							
IOC, Panipat	6.00	6.00	6.00	6.00	12.00	12.00	12.00
IOC, Mathura	7.50	7.50	7.50	7.50	7.50	7.50	7.50
Sub total	13.50	13.50	13.50	13.50	19.50	19.50	19.50
Southern Region							
MRL, Madras	6.50	6.50	6.50	9.50	9.50	9.50	9.50
CRL, Cochin	7.50	7.50	7.50	7.50	13.50	13.50	13.50
MRL , Narimanam	0.50	0.50	0.50	0.50	0.50	0.50	0.50
HPCL, Vishakh	7.50	7.50	7.50	7.50	7.50	7.50	7.50
MRPL, Mangalore	9.69	9.69	9.69	9.69	9.69	9.69	9.69
Pennar, Cuddalore			6.00	6.00	6.00	6.00	6.00
Sub total	31.69	31.69	37.69	40.69	46.69	46.69	46.69
Eastern Region							
IOC, Barauni	4.20	4.20	6.00	6.00	6.00	6.00	6.00
IOC, Haldia	3.75	3.75	3.75	3.75	3.75	3.75	3.75
IOC/JV, Paradeep					9.00	9.00	9.00
IOC, Guwahati	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IOC, Digboi	0.65	0.65	0.65	0.65	0.65	0.65	0.65
BR&PL, Bongaigaon	2.35	2.35	2.35	2.35	2.35	2.35	2.35
NRL, Numaligarh	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Sub total	14.95	14.95	16.75	16.75	25.75	25.75	25.75
Western Region							
BPCL, Mumbai	6.90	6.90	6.90	6.90	6.90	6.90	6.90
HPCL, Mumbai	5.50	5.50	5.50	5.50	5.50	5.50	5.50
Reliance, Sikka	27.00	27.00	27.00	27.00	27.00	27.00	27.00
IOC, Koyali	12.50	12.50	12.50	12.50	12.50	12.50	12.50
Essar, Vadinar					10.50	10.50	10.50
BPCL/OOC, Bina					6.00	6.00	6.00
Sub total	51.90	51.90	51.90	51.90	68.40	68.40	68.40
Total	112.04	112.04	119.84	122.84	160.34	160.34	160.34

Annexure 3.2

Expected refining throughputs of refineries (MMTPA)-Alternate case

Refinery	*2000/01*	*2001/02*	*2002/03*	*2003/04*	*2004/05*	*2005/06*	*2006/07*
Northern Region							
IOC, Panipat	6.00	6.00	6.00	6.00	12.00	12.00	12.00
IOC, Mathura	7.50	7.50	7.50	7.50	7.50	7.50	7.50
Sub total	13.50	13.50	13.50	13.50	19.50	19.50	19.50
Southern Region							
MRL, Madras	6.50	6.50	6.50	9.50	9.50	9.50	9.50
CRL, Cochin	7.50	7.50	7.50	7.50	13.50	13.50	13.50
MRL, Narimanam	0.50	0.50	0.50	0.50	0.50	0.50	0.50
HPCL, Vishakh	7.50	7.50	7.50	7.50	7.50	7.50	7.50
MRPL, Mangalore	9.69	9.69	9.69	9.69	9.69	9.69	9.69
Pennar, Cuddalore			6.00	6.00	6.00	6.00	6.00
Sub total	31.69	31.69	37.69	40.69	46.69	46.69	46.69
Eastern Region							
IOC, Barauni	4.20	4.20	6.00	6.00	6.00	6.00	6.00
IOC, Haldia	3.75	3.75	3.75	3.75	3.75	3.75	7.50
IOC/JV, Paradeep					9.00	9.00	9.00
IOC, Guwahati	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IOC, Digboi	0.65	0.65	0.65	0.65	0.65	0.65	0.65
BR&PL, Bongaigaon	2.35	2.35	2.35	2.35	2.35	2.35	2.35
NRL, Numaligarh	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Sub total	14.95	14.95	16.75	16.75	25.75	25.75	29.50
Western Region							
BPCL, Mumbai	6.90	6.90	6.90	6.90	12.00	12.00	12.00
HPCL, Mumbai	5.50	5.50	5.50	5.50	5.50	5.50	5.50
Reliance, Sikka	27.00	27.00	27.00	27.00	27.00	27.00	27.00
IOC, Koyali	12.50	12.50	18.00	18.00	18.00	18.00	18.00
Essar, Vadinar					10.50	10.50	10 50
BPCL/OOC, Bina					6.00	6.00	6.00
Sub total	51.90	51.90	57.40	57.40	79.00	79.00	79.00
Total	112.04	112.04	125.34	128.34	170.94	170.94	174.69

4 Demand-supply balances

The demand projections for various petroleum products in the country and the northern region were presented in Chapter 2. Region wise production of petroleum products was subsequently covered in Chapter 3. Two supply scenarios were considered, namely, a base case and an alternate case. Supply projections under the base case draw on confirmed expansions/addition to the existing refining capacity. The alternate case considers, in addition to the base case materialisation schedule, low cost expansions of three refineries- BPCL, Mumbai; IOC, Koyali and IOC, Haldia.

Product movement for controlled products currently takes place under the SPM discipline. The changes that are likely to occur after complete deregulation in 2002 cannot be fully anticipated. Nonetheless, the following assumptions have been made in this study for projecting the inter-regional product flows and imports:

a) Inter-regional movements will continue to take place subject to market economics
b) The duty structure on petroleum products will be rationalised as per the recommendations of the Expert Technical Group.
c) Surplus product from one region will, in the first instance, move to a deficit region that is logistically best placed to receive the transfer.

Regional demand supply balances under the two scenarios are presented for the years 2001/02, 2006/07 and 2011/12 in the following section. Annual balances for the balance years of the projection period are presented in Annexure 4.1 through 4.12.

Base case

2001/02

The regional demand supply balance for 2001/02 is summarised in Table 4.1

.

Table 4.1 Regional demand-supply balance: Base case - 2001/02 (TMT)

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total**
Demand								
Northern Region	2453	2106	718	930	2617	14311	2766	25900
Southern Region	2071	1820	1915	462	2857	13460	3658	26242
Eastern Region	1461	961	2307	319	4016	9456	1647	20167
Western Region	2425	1981	6937	824	3977	12981	6706	35831
Total	8410	6867	11876	2534	13468	50207	14777	108140
Supply								
Northern Region	596	1495	600	677	1183	5565	1273	11390
Southern Region	796	2735	2584	537	2504	12772	4628	26556
Eastern Region	344	190	1528	309	1709	5575	1166	10821
Western Region	4584	3857	5313	1111	3450	17532	4375	40222
Total	6321	8277	10025	2634	8846	41443	11443	88989
Deficit								
Northern Region	-1857	-611	-117	-253	-1434	-8746	-1493	-14510
Southern Region	-1275	915	669	75	-353	-687	970	314
Eastern Region	-1117	-771	-779	-10	-2308	-3881	-481	-9346
Western Region	2159	1876	-1623	287	-527	4550	-2331	4391
Total	-2090	1410	-1850	99	-4622	-8764	-3334	-19151
Imports/Exports								
Gross Exports		1410		99				1509
Gross Imports	-2090		-1850		-4622	-8764	-3334	-20660

* Reflects the sum of the listed seven products only

In 2001/02, demand exceeds the availability of petroleum products resulting in an overall deficit of 19.1 MMT. Deficits are expected for all products except MS and ATF, whose surpluses add up to 1.5 MMT. Gross import requirements would be of the order of 20.6 MMT.

An analysis of regional deficits indicates an overall surplus in the western region. This surplus accrues from a concentration of refining capacity in the west –Reliance, 27 MMTPA; IOC, 12.5 MMTPA; HPCL 5.5, MTPA; and BPCL, 6.9 MMTPA. Deficits are highest in the northern region aggregating to 14.5 MMT.

Demand supply balance: Northern region

The product demand supply balance in the northern region is summarised in Table 4.2.

Table 4.2 Northern region demand-supply balance: Base case - 2001/02 (TMT)

State	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Demand								
Punjab	376	482	61	77	464	2987	1111	5556
Haryana	288	217	0	30	228	2324	594	3680
Delhi	653	645	0	669	296	1619	133	4014
Rajasthan	336	293	333	56	563	3480	373	5433
Jammu & Kashmir	79	73	0	22	174	297	27	672
Himachal Pradesh	83	41	0	0	65	320	30	539
Chandigarh	41	69	0	31	24	96	24	287
Uttar Pradesh-West	598	287	324	45	805	3189	473	5720
Total	2453	2106	718	930	2617	14311	2766	25900
Supply								
Haryana	144	695	176	191	636	2530	493	4863
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	596	1495	600	677	1183	5565	1273	11390
Deficit								
Punjab	-376	-482	-61	-77	-464	-2987	-1111	-5556
Haryana	-144	478	176	160	408	206	-101	1183
Delhi	-653	-645	0	-669	-296	-1619	-133	-4014
Rajasthan	-336	-293	-333	-56	-563	-3480	-373	-5433
Jammu & Kashmir	-79	-73	0	-22	-174	-297	-27	-672
Himachal Pradesh	-83	-41	0	0	-65	-320	-30	-539
Chandigarh	-41	-69	0	-31	-24	-96	-24	-287
Uttar Pradesh-West	-145	514	100	441	-257	-153	307	806
Total	-1857	-611	-117	-253	-1434	-8746	-1493	-14510

* Reflects the sum of the listed seven products only

As indicated in Chapter 2, in light of the existing distribution infrastructure, the state of Uttar Pradesh was split into two parts, wherein the demand of the eastern part was consolidated with the eastern region. Western Uttar Pradesh hosts the Mathura refinery, the products from which feed the markets in western Uttar Pradesh and the northern region. However, despite the Mathura refinery and the Panipat refinery, a deficit of 14.5 MMT is expected in the northern region by 2001/02. Bulk of this deficit accrues from shortfalls in availability of HSD. Given the northern deficits, demand in north would have to be met through surpluses from other adjoining regions.

In 1998, the Ministry of Petroleum and Natural Gas, initiated a phased programme for the deregulation of the oil sector, to be concluded by the year 2001/02. Currently, the pricing and distribution of controlled products, LPG, SKO, MS, ATF and HSD, is controlled by the Ministry. The marketing companies are reimbursed for any costs related to cross hauling of products from one zone to another. Actual product distribution in 2001/02, thus would still be as per directives from the Ministry. However, post-deregulation, beyond 2001/02, the prices for all products would be decontrolled and may move

towards import parity. Oil companies would then have to work out their own marketing strategy.

Distribution arrangements in the north-west include the 6 MMTPA Kandla-Bathinda pipeline from Gujarat to Punjab. In 1998/99, 5.5 MMT of petroleum products were transported through the Kandla-Bathinda pipeline. In 2001/02, deficits in north would continue to be met through the Kandla-Bathinda pipeline. It is assumed that the surplus from refineries in the west would move by proposed pipelines/rail/coastal movements to Kandla to the extent of it being evacuated to the north through the Kandla-Bathinda pipeline.

In addition, GAIL's 1.7 MMTPA (Phase 1) LPG pipeline from Jamnagar, Gujarat to Loni, Uttar Pradesh is expected to be operational by February 2001. This pipeline would facilitate movement of surplus LPG from the western region to the northern region. Product movement is also possible by rail/road.

Given, the above mentioned, the expected product flows in the northern region in 2001/02 are summarised in Table 4.3.

Table 4.3 Northern region product flows: Base case - 2001/02 (TMT)

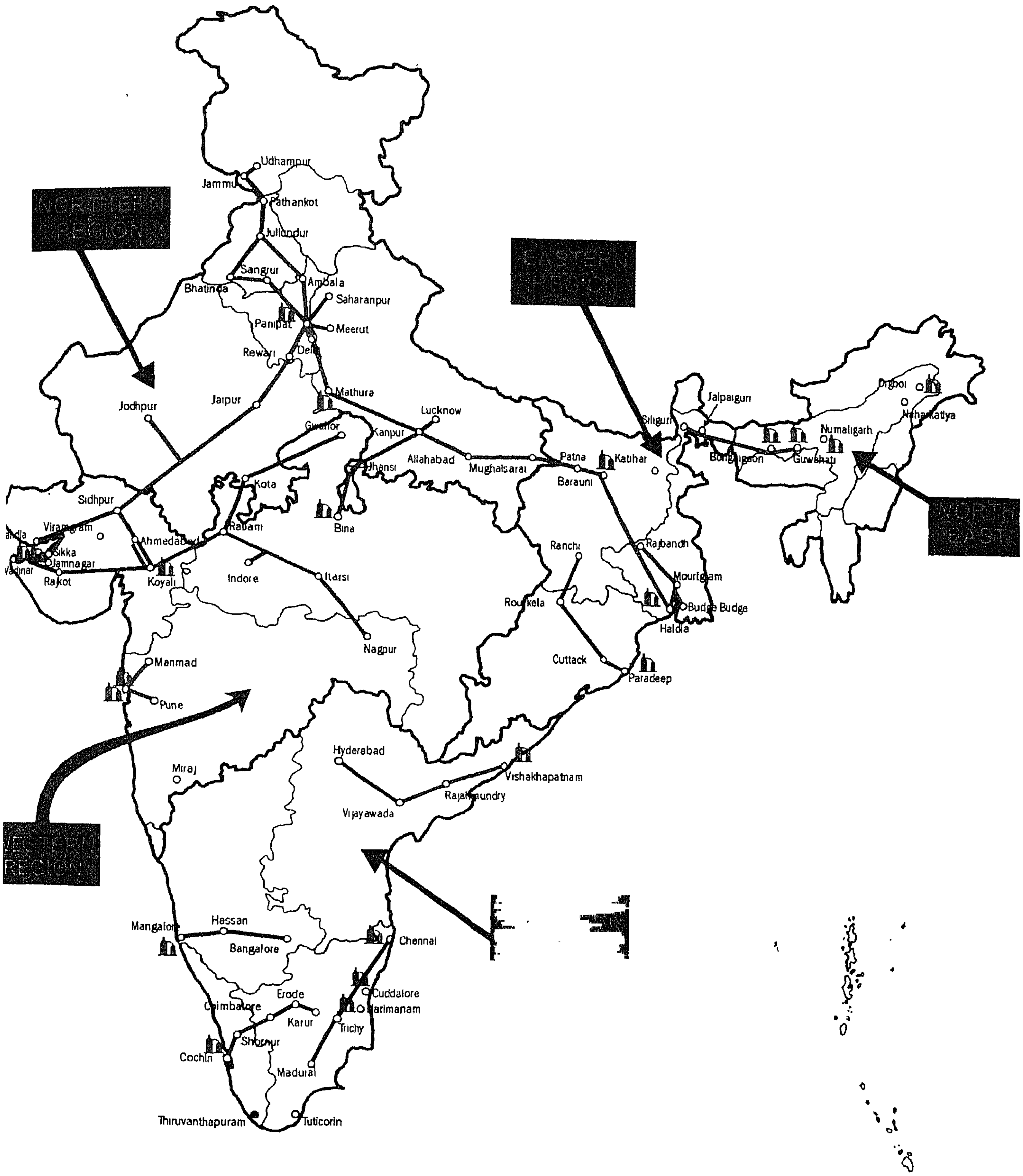
Element	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Northern Deficit	-1857	-611	-117	-253	-1434	-8746	-1493	-14510
Western Surplus	2159	1876	-1623	287	-527	4550	-2331	4391
Northern Supply								
-via KB Pipeline		611		253		4550	0	5414
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	157							157
Total Supply	1857	611	0	253	0	4550	0	7271
Residual Deficit	0	0	-117	0	-1434	-4196	-1493	-7239

* Reflects the sum of the listed seven products only

In 2001/02, the expected throughput of the Kandla-Bathinda pipeline is 5.4 MMT. With high LPG deficits in the north, full utilisation of GAIL's LPG pipeline is expected. In addition, LPG would also be moved by rail/road tankwagons to the north.

However, even after utilisation of the western surplus, a deficit of 7.2 MMT remains.

It may be noted here that the above deficit has been estimated with refinery throughputs at 95% of the name plate capacities. Over the last few years, on account of a deficit situation, Indian refineries have been operating beyond their rated capacities. The above deficit may, thus, be met by either higher utilisation



Existing Refinery
Refinery Under Construction
Proposed Refinery

Existing Product Pipeline
Product Pipeline Under Construction
Proposed Product Pipeline

INDIA
Existing, Under Construction and Proposed Refineries and Product Pipelines

Date : May 2000

Figure : 4.1

of existing refineries or through product imports in the west at Kandla. Given the time frame till 2001/02 from the current date, it is not feasible to put up a new refinery to meet the above mentioned deficit.

2006/07

The regional demand supply balance for 2006/07 is summarised in Table 4.4.

Table 4.4 Regional demand-supply balance: Base case - 2006/07 (TMT)

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Demand								
Northern Region	3566	3042	832	1212	3252	21499	3954	37358
Southern Region	3011	2629	2220	602	3550	20221	7046	39278
Eastern Region	2124	1389	3247	416	4990	14206	2073	28444
Western Region	3525	2861	6634	1075	4942	19502	9791	48329
Total	12225	9921	12932	3305	16734	75428	22864	153409
Supply								
Northern Region	740	2190	776	867	1819	8094	1766	16253
Southern Region	1279	4116	3672	1263	3604	18729	6107	38770
Eastern Region	708	618	2312	309	3682	10754	1235	19618
Western Region	5119	6097	5574	1648	4674	24419	5571	53102
Total	7846	13021	12335	4088	13779	61996	14679	127743
Deficit								
Northern Region	-2826	-852	-56	-345	-1433	-13405	-2188	-21105
Southern Region	-1731	1487	1453	661	54	-1492	-940	-508
Eastern Region	-1416	-771	-935	-106	-1309	-3451	-837	-8825
Western Region	1594	3236	-1059	573	-267	4917	-4220	4773
Total	-4380	3100	-597	783	-2955	-13432	-8185	-25666
Imports/Exports/Domestic Production								
Gross Exports		1876		783				2659
Gross Imports/ Domestic Production	-4380		-597		-2955	-13432	-8185	-29548

* Reflects the sum of the listed seven products only

Clearly, the overall demand outstrips domestic availability of petroleum products resulting in an overall deficit of 25.6 MMT. MS and ATF surpluses add up to 2.7 MMT. Gross import requirements would be of the order of 30MMT.

An analysis of regional deficits indicates an overall surplus in the western region. Additional refining capacity in the west to that in 2001/02 includes Essar, 10.5 MMTPA and BPCL-Bina, 6 MMTPA.

Demand supply balance: Northern region

The product demand supply balance in the northern region is summarised in Table 4.5.

Table 4.5 Northern region demand-supply balance: Base case - 2006/07 (TMT)

State	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Demand								
Punjab	546	696	71	100	576	4487	1872	8348
Haryana	418	313	0	39	283	3491	747	5292
Delhi	949	931	0	872	368	2432	167	5719
Rajasthan	489	423	385	73	699	5228	470	7766
Jammu & Kashmir	115	106	0	28	216	446	34	945
Himachal Pradesh	120	60	0	0	80	481	38	779
Chandigarh	60	100	0	41	30	144	31	406
Uttar Pradesh-West	869	414	376	58	1000	4790	596	8103
Total	3566	3042	832	1212	3252	21499	3954	37358
Supply								
Haryana	288	1390	352	381	1272	5059	985	9727
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	740	2190	776	867	1819	8094	1766	16253
Deficit								
Punjab	-546	-696	-71	-100	-576	-4487	-1872	-8348
Haryana	-131	1077	352	342	989	1568	238	4435
Delhi	-949	-931	0	-872	-368	-2432	-167	-5719
Rajasthan	-489	-423	-385	-73	-699	-5228	-470	-7766
Jammu & Kashmir	-115	-106	0	-28	-216	-446	-34	-945
Himachal Pradesh	-120	-60	0	0	-80	-481	-38	-779
Chandigarh	-60	-100	0	-41	-30	-144	-31	-406
Uttar Pradesh-West	-416	386	48	428	-452	-1755	185	-1577
Total	-2826	-852	-56	-345	-1433	-13405	-2188	-21105

* Reflects the sum of the listed seven products only

A deficit of 21 MMT is expected in the northern region by 2006/07. Bulk of this deficit accrues from shortfalls in availability of HSD. Given the northern deficits, demand in north would have to be met either through surpluses from the western region or through additional refining capacity in the north or through imports or a combination of these.

Inter-region product flows

Post-deregulation, beyond 2001/02, the prices for all products would be decontrolled. Oil companies would have to work out their own marketing plans. In the absence of any directives from the Ministry, product movements would be governed by economics of least transportation cost and market forces.

The capacity of the Kandla-Bathinda pipeline is expected to be increased from 6 MMTPA to 11.5 MMTPA. Given the existing transportation infrastructure, the western surplus would continue to flow northwards to meet the deficits in the north. In addition, GAIL's Jamnagar-Loni LPG pipeline would continue to be the most economical route to evacuate surplus LPG from the west to the northern region.

The Bina refinery is located at the peripheries of the western region and its economic supply area lies to the north and the east (see map in Figure 4.1) and not the western region itself, which would result in considerable backfreighting. Apart from meeting the local demand in the districts adjacent to Bina, it is assumed the rest of the output of the Bina refinery is available for the eastern region (Table 4.6).

Table 4.6 Northern region product flows: Base case - 2006/07 (TMT)

Element	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total**
Northern Deficit	-2826	-852	-56	-345	-1433	-13405	-2188	-21105
Western Surplus	1594	3236	-1059	573	-267	4917	-4220	4773
Bina Production Likely Movement	140	677	86	62	1035	1583	1067	4648
(a) Madhya Pradesh	136	114	86	30	241	836	51	1494
(b) Eastern Region	3	564	0	32	793	747	1015	3155
W Surplus excluding (b)	1590	2672	-1059	541	-1061	4169	-5235	1618
Northern Supply								
-via KB Pipeline		852		345		4169		5366
-via Jamnagar-Loni Pipeline	1590							1590
Total Supply	1590	852	0	345	0	4169	0	6956
Residual Deficit	-1236	0	-56	0	-1433	-9236	-2188	-14149

* Reflects the sum of the listed seven products only

The western surplus available for the Kandla-Bathinda pipeline, therefore stands reduced to the extent of product movement from the Bina refinery to the eastern region. Products from Bina refinery, thus, move to the eastern region even though the western region itself is deficit for some products. Western deficits for these products would have to be met through additional imports.

Deficits in the north are thus partly met via the Kandla-Bathinda pipeline and the Jamnagar-Loni pipeline. As against a capacity of 11.5 MMT, the anticipated throughput of the Kandla-Bathinda pipeline is only 5.4 MMT. It will therefore have considerable spare capacity. The same is the case for the LPG pipeline whose utilisation is constrained by limited availability of LPG surplus in the west.

Again, the net deficit of 14.1 MMT may be met through higher utilisation of existing refineries, product imports at Kandla, and/or additional refining capacity in the north.

2011/12

The regional demand supply balance for 2011/12 is summarised in Table 4.7.

Table 4.7 Regional demand-supply balance: Base case - 2011/12 (TMT)

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Demand								
Northern Region	5065	4395	964	1583	3960	32299	4412	52679
Southern Region	4276	3798	2573	786	4323	30378	7651	53786
Eastern Region	3017	2006	3525	543	6077	21341	2345	38854
Western Region	5007	4134	7352	1404	6018	29299	10756	63969
Total	**17366**	**14333**	**14414**	**4316**	**20378**	**113318**	**25164**	**209289**
Supply								
Northern Region	740	2190	776	867	1819	8094	1766	16253
Southern Region	1279	4116	3672	1263	3604	18729	6107	38770
Eastern Region	708	618	2312	309	3682	10754	1235	19618
Western Region	5119	6097	5574	1648	4674	24419	5571	53102
Total	**7846**	**13021**	**12335**	**4088**	**13779**	**61996**	**14679**	**127743**
Deficit								
Northern Region	-4325	-2205	-188	-716	-2141	-24205	-2646	-36426
Southern Region	-2997	318	1099	477	-719	-11650	-1544	-15016
Eastern Region	-2309	-1388	-1213	-234	-2395	-10587	-1110	-19236
Western Region	111	1963	-1778	244	-1344	-4880	-5185	-10867
Total	**-9520**	**-1312**	**-2079**	**-229**	**-6599**	**-51322**	**-10485**	**-81546**
Imports/Exports/Domestic Production								
Gross Exports								0
Gross Imports/ Domestic Production	-9520	-1312	-2079	-229	-6599	-51322	-10485	-81546

* Reflects the sum of the listed seven products only

By 2011/12, demand far exceeds domestic availability of petroleum products resulting in an overall deficit of 81.5 MMT. Given that there are no additions/expansions to the refining capacity beyond 2006/07, there is a deficit situation for all petroleum products in all regions.

Demand supply balance: Northern region

The product demand supply balance in the northern region is summarised in Table 4.8.

Table 4.8 Northern region demand-supply balance: Base case - 2011/12 (TMT)

State	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Demand								
Punjab	776	1005	82	131	702	6741	2056	11492
Haryana	594	452	0	51	344	5245	846	7533
Delhi	1348	1345	0	1139	448	3654	189	8123
Rajasthan	694	611	447	95	851	7854	532	11083
Jammu & Kashmir	163	153	0	37	263	669	39	1324
Himachal Pradesh	170	86	0	0	98	723	43	1120
Chandigarh	86	145	0	53	37	216	35	572
Uttar Pradesh-West	1234	598	435	76	1217	7197	674	11432
Total	5065	4395	964	1583	3960	32299	4412	52679
Supply								
Haryana	288	1390	352	381	1272	5059	985	9727
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	740	2190	776	867	1819	8094	1766	16253
Deficit								
Punjab	-776	-1005	-82	-131	-702	-6741	-2056	-11492
Haryana	-307	937	352	330	927	-186	140	2194
Delhi	-1348	-1345	0	-1139	-448	-3654	-189	-8123
Rajasthan	-694	-611	-447	-95	-851	-7854	-532	-11083
Jammu & Kashmir	-163	-153	0	-37	-263	-669	-39	-1324
Himachal Pradesh	-170	-86	0	0	-98	-723	-43	-1120
Chandigarh	-86	-145	0	-53	-37	-216	-35	-572
Uttar Pradesh-West	-782	202	-11	410	-670	-4161	106	-4906
Total	-4325	-2205	-188	-716	-2141	-24205	-2646	-36426

* Reflects the sum of the listed seven products only

With a total supply of only 16.3 MMT, the deficit in the northern region is about 36 MMT.

Inter-region product flows

By 2011/12, while the western region has a combined deficit, it has surplus availability of LPG, MS and ATF. However, on accounted of the limited domestic surpluses, low throughputs are expected through the Kandla-Bathinda and the Jamnagar-Loni pipelines and their capacities remain largely unutilised. The likely product flows in the northern region by 2011/12 are summarised in Table 4.9.

Table 4.9 Northern region product flows: Base case – 2011/12 (TMT)

Element	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Northern Deficit	-4325	-2205	-188	-716	-2141	-24205	-2646	-36426
Western Surplus	111	1963	-1778	244	-1344	-4880	-5185	-10867
Bina Production Likely Movement	140	677	86	62	1035	1583	1067	4648
(a) Madhya Pradesh	140	164	86	39	294	1255	57	2034
(b) Eastern Region	0	513	0	22	741	328	1010	2614
W Surplus excluding (b)	111	1450	-1778	221	-2084	-5207	-6195	-13482
Northern Supply								
-via KB Pipeline		1450		221				1672
-via Jamnagar-Loni Pipeline	111							111
Total Supply	111	1450	0	221	0	0	0	1783
Residual Deficit	-4214	-755	-188	-494	-2141	-24205	-2646	-34643

* Reflects the sum of the listed seven products only

The net deficit of 35 MMT in the northern region can be met through additional refining capacity in the north and by imports utilising the unused capacities of the Kandla-Bathinda and Jamnagar-Loni pipelines.

Alternate case

2001/02

The regional demand supply balance for 2001/02 under the alternate supply case is summarised in Table 4.10.

Table 4.10 Regional demand-supply balance: Alternate case - 2001/02 (TMT)

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Demand								
Northern Region	2453	2106	718	930	2617	14311	2766	25900
Southern Region	2071	1820	1915	462	2857	13460	3658	26242
Eastern Region	1461	961	2307	319	4016	9456	1647	20167
Western Region	2425	1981	6937	824	3977	12981	6706	35831
Total	8410	6867	11876	2534	13468	50207	14777	108140
Supply								
Northern Region	596	1495	600	677	1183	5565	1273	11390
Southern Region	796	2735	2584	537	2504	12772	4628	26556
Eastern Region	344	190	1528	309	1709	5575	1166	10821
Western Region	4584	3857	5313	1111	3450	17532	4375	40222
Total	6321	8277	10025	2634	8846	41443	11443	88989
Deficit								
Northern Region	-1857	-611	-117	-253	-1434	-8746	-1493	-14510

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total**
Southern Region	-1275	915	669	75	-353	-687	970	314
Eastern Region	-1117	-771	-779	-10	-2308	-3881	-481	-9346
Western Region	2159	1876	-1623	287	-527	4550	-2331	4391
Total	-2090	1410	-1850	99	-4622	-8764	-3334	-19151
Imports/Exports								
Gross Exports		1410		99				1509
Gross Imports	-2090		-1850		-4622	-8764	-3334	-20660

* Reflects the sum of the listed seven products only

As in the base case, demand exceeds availability of petroleum products resulting in an overall deficit of 19.2 MMT. Deficits are expected for all products except MS and ATF, whose surpluses add up to 1.5 MMT. Gross import requirements would be of the order of 20.6 MMT.

An analysis of regional deficits indicates an overall surplus in the western region. The western region however is expected to have deficits for SKO and FO/LSHS.

Demand supply balance: Northern region

The product demand supply balance in the northern region is summarised in Table 4.11.

Table 4.11 Northern region demand-supply balance: Alternate case - 2001/02 (TMT)

State	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total**
Demand								
Punjab	376	482	61	77	464	2987	1111	5556
Haryana	288	217	0	30	228	2324	594	3680
Delhi	653	645	0	669	296	1619	133	4014
Rajasthan	336	293	333	56	563	3480	373	5433
Jammu & Kashmir	79	73	0	22	174	297	27	672
Himachal Pradesh	83	41	0	0	65	320	30	539
Chandigarh	41	69	0	31	24	96	24	287
Uttar Pradesh-West	598	287	324	45	805	3189	473	5720
Total	2453	2106	718	930	2617	14311	2766	25900
Supply								
Haryana	144	695	176	191	636	2530	493	4863
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	596	1495	600	677	1183	5565	1273	11390
Deficit								
Punjab	-376	-482	-61	-77	-464	-2987	-1111	-5556
Haryana	-144	478	176	160	408	206	-101	1183
Delhi	-653	-645	0	-669	-296	-1619	-133	-4014

State	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Rajasthan	-336	-293	-333	-56	-563	-3480	-373	-5433
Jammu & Kashmir	-79	-73	0	-22	-174	-297	-27	-672
Himachal Pradesh	-83	-41	0	0	-65	-320	-30	-539
Chandigarh	-41	-69	0	-31	-24	-96	-24	-287
Uttar Pradesh-West	-145	514	100	441	-257	-153	307	806
Total	-1857	-611	-117	-253	-1434	-8746	-1493	-14510

* Reflects the sum of the listed seven products only

An overall deficit of 14.5 MMT is expected in the northern region. Bulk of this deficit accrues from shortfalls in availability of HSD. This deficit would have to be met essentially through surpluses from the western region.

As in the base case, options to move products from the western region to the northern region include the Kandla-Bathinda pipeline, the Jamnagar-Loni pipeline and rail/road tankwagons. The expected product flows in the northern region in 2001/02 are summarised in Table 4.12.

Table 4.12 Northern region product flows: Alternate case - 2001/02 (TMT)

Element	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Northern Deficit	-1857	-611	-117	-253	-1434	-8746	-1493	-14510
Western Surplus	2159	1876	-1623	287	-527	4550	-2331	4391
Northern Supply								
-via KB Pipeline		611		253		4550	0	5414
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	157							157
Total Supply	1857	611	0	253	0	4550	0	7271
Residual Deficit	0	0	-117	0	-1434	-4196	-1493	-7239

* Reflects the sum of the listed seven products only

Against a capacity of 6 MMTPA , the throughput through the Kandla-Bathinda pipeline is expected to be 5.4 MMTPA. GAIL's LPG pipeline is expected to be fully utilised. The remaining western surplus (LPG) would move to the north by rail/road tankwagons.

After utilisation of the western surplus, a deficit of 7.2 MMT still remains. This deficit may be met through additional imports at Kandla or higher utilisation of existing refineries.

2006/07

The regional demand supply balance for 2006/07, under the alternate supply case is summarised in Table 4.13.

Table 4.13 Regional demand-supply balance: Alternate case - 2006/07 (TMT)

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Demand								
Northern Region	3566	3042	832	1212	3252	21499	3954	37358
Southern Region	3011	2629	2220	602	3550	20221	7046	39278
Eastern Region	2124	1389	3247	416	4990	14206	2073	28444
Western Region	3525	2861	6634	1075	4942	19502	9791	48329
Total	12225	9921	12932	3305	16734	75428	22864	153409
Supply								
Northern Region	740	2190	776	867	1819	8094	1766	16253
Southern Region	1279	4116	3672	1263	3604	18729	6107	38770
Eastern Region	756	768	2516	469	3707	12032	1986	22234
Western Region	5431	6643	7097	2007	5390	28080	7268	61915
Total	8206	13716	14062	4606	14520	66935	17126	139172
Deficit								
Northern Region	-2826	-852	-56	-345	-1433	-13405	-2188	-21105
Southern Region	-1731	1487	1453	661	54	-1492	-940	-508
Eastern Region	-1368	-621	-730	53	-1283	-2173	-86	-6210
Western Region	1906	3782	463	932	448	8577	-2523	13586
Total	-4019	3796	1130	1301	-2214	-8493	-5737	-14237
Imports/Exports/Domestic Production								
Gross Exports		3796	1130	1301				6226
Gross Imports/ Domestic Production	-4019				-2214	-8493	-5737	-20464

* Reflects the sum of the listed seven products only

As in the base case, the overall demand outstrips domestic availability of petroleum products resulting in an overall deficit of 14.2 MMT. MS, naphtha and ATF surpluses add up to 6.2 MMT. Netting exports from the total deficit, the import requirements would be of the order of 20.5 MMT.

An analysis of regional deficits indicates an overall surplus of 13.6 MMT in the western region.

Demand supply balance: Northern region

The product demand supply balance in the northern region is summarised in Table 4.14.

Table 4.14 Northern region demand-supply balance: Alternate case - 2006/07 (TMT)

State	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Demand								
Punjab	546	696	71	100	576	4487	1872	8348
Haryana	418	313	0	39	283	3491	747	5292
Delhi	949	931	0	872	368	2432	167	5719
Rajasthan	489	423	385	73	699	5228	470	7766
Jammu & Kashmir	115	106	0	28	216	446	34	945
Himachal Pradesh	120	60	0	0	80	481	38	779
Chandigarh	60	100	0	41	30	144	31	406

State	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Uttar Pradesh-West	869	414	376	58	1000	4790	596	8103
Total	3566	3042	832	1212	3252	21499	3954	37358
Supply								
Haryana	288	1390	352	381	1272	5059	985	9727
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	740	2190	776	867	1819	8094	1766	16253
Deficit								
Punjab	-546	-696	-71	-100	-576	-4487	-1872	-8348
Haryana	-131	1077	352	342	989	1568	238	4435
Delhi	-949	-931	0	-872	-368	-2432	-167	-5719
Rajasthan	-489	-423	-385	-73	-699	-5228	-470	-7766
Jammu & Kashmir	-115	-106	0	-28	-216	-446	-34	-945
Himachal Pradesh	-120	-60	0	0	-80	-481	-38	-779
Chandigarh	-60	-100	0	-41	-30	-144	-31	-406
Uttar Pradesh-West	-416	386	48	428	-452	-1755	185	-1577
Total	-2826	-852	-56	-345	-1433	-13405	-2188	-21105

* Reflects the sum of the listed seven products only

Of the deficit of 21.1 MMT in the northern region, the bulk accrues from shortfalls in availability of HSD.

Again, the deficits in the north would have to be met either through surpluses from the adjoining regions or through additional refining capacity in the north or a combination of both.

Inter-region product flows

As in the base case, deficits in the north would be met from the western surplus through the Kandla-Bathinda & Jamnagar-Loni pipelines.

The expected product flows in the northern region in 2006/07 are summarised in Table 4.15.

Table 4.15 Northern region product flows: Alternate case - 2006/07 (TMT)

Element	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Northern Deficit	-2826	-852	-56	-345	-1433	-13405	-2188	-21105
Western Surplus	1906	3782	463	932	448	8577	-2523	13586
Bina Production Likely Movement	140	677	86	62	1035	1583	1067	4648
(a) Madhya Pradesh	136	114	86	30	241	836	51	1494
(b) Eastern Region	3	564	0	32	793	747	1015	3155
W Surplus excluding (b)	1903	3218	463	900	-345	7830	-3538	10431
Northern Supply								
-via KB Pipeline		852	56	345		7830		9083
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	203							203
Total Supply	1903	852	56	345	0	7830	0	10986
Residual Deficit	-923	0	0	0	-1433	-5575	-2188	-10119

* Reflects the sum of the listed seven products only

The Kandla-Bathinda pipeline is left with a spare capacity of 2.4 MMTPA. The capacity of the LPG pipeline is, however, fully utilised and the balance western LPG surplus is expected to move by rail/road to the north.

Thus, after absorption of the western surplus, a deficit of 10.1 MMT in the northern region remains. The deficit accrues from shortfalls in availability of LPG, SKO, HSD and FO /LSHS and can be met through product imports in the west or higher utilisation of existing refineries or additional refining capacity in the north.

2011/12

The regional demand supply balance for 2011/12 is summarised in Table 4.16.

Table 4.16 Regional demand-supply balance: Alternate case - 2011/12 (TMT)

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total**
Demand								
Northern Region	5065	4395	964	1583	3960	32299	4412	52679
Southern Region	4276	3798	2573	786	4323	30378	7651	53786
Eastern Region	3017	2006	3525	543	6077	21341	2345	38854
Western Region	5007	4134	7352	1404	6018	29299	10756	63969
Total	17366	14333	14414	4316	20378	113318	25164	209289
Supply								
Northern Region	740	2190	776	867	1819	8094	1766	16253
Southern Region	1279	4116	3672	1263	3604	18729	6107	38770
Eastern Region	756	768	2516	469	3707	12032	1986	22234
Western Region	5431	6643	7097	2007	5390	28080	7268	61915
Total	8206	13716	14062	4606	14520	66935	17126	139172
Deficit								
Northern Region	-4325	-2205	-188	-716	-2141	-24205	-2646	-36426
Southern Region	-2997	318	1099	477	-719	-11650	-1544	-15016
Eastern Region	-2261	-1238	-1008	-74	-2370	-9309	-359	-16621
Western Region	424	2509	-255	603	-628	-1219	-3488	-2054
Total	-9160	-616	-353	290	-5858	-46383	-8037	-70117
Imports/Exports/Domestic Production								
Gross Exports				290				290
Gross Imports/ Domestic Production	-9160	-616	-353		-5858	-46383	-8037	-70407

* Reflects the sum of the listed seven products only

By 2011/12, demand far exceeds domestic availability of petroleum products resulting in an overall deficit of 70.1 MMT, indicating a need for additional refining capacity in all regions.

Demand supply balance: Northern region

The product demand supply balance in the northern region is summarised in Table 4.16.

Table 4.16 Northern region demand-supply balance: Alternate case - 2011/12 (TMT)

State	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Demand								
Punjab	776	1005	82	131	702	6741	2017	11453
Haryana	594	452	0	51	344	5245	825	7512
Delhi	1348	1345	0	1139	448	3654	184	8119
Rajasthan	694	611	447	95	851	7854	519	11071
Jammu & Kashmir	163	153	0	37	263	669	38	1323
Himachal Pradesh	170	86	0	0	98	723	42	1119
Chandigarh	86	145	0	53	37	216	34	571
Uttar Pradesh-West	1234	598	435	76	1217	7197	658	11416
Total	5065	4395	964	1583	3960	32299	4412	52679
Supply								
Haryana	288	1390	352	381	1272	5059	985	9727
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	740	2190	776	867	1819	8094	1766	16253
Deficit								
Punjab	-776	-1005	-82	-131	-702	-6741	-2017	-11453
Haryana	-307	937	352	330	927	-186	160	2215
Delhi	-1348	-1345	0	-1139	-448	-3654	-184	-8119
Rajasthan	-694	-611	-447	-95	-851	-7854	-519	-11071
Jammu & Kashmir	-163	-153	0	-37	-263	-669	-38	-1323
Himachal Pradesh	-170	-86	0	0	-98	-723	-42	-1119
Chandigarh	-86	-145	0	-53	-37	-216	-34	-571
Uttar Pradesh-West	-782	202	-11	410	-670	-4161	123	-4890
Total	-4325	-2205	-188	-716	-2141	-24205	-2646	-36426

* Reflects the sum of the listed seven products only

The deficit in the northern region adds up to 36 MMT which would be met through the western surpluses, product imports and additional refining capacity.

Inter-region product flows

By 2011/12, deficits in the north continue be met from the western surplus through the Kandla-Bathinda & Jamnagar-Loni pipelines. The expected product flows in the northern region are summarised in Table 4.17.

Table 4.17 Northern region product flows: Alternate case - 2011/12 (TMT)

Element	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total*
Northern Deficit	-4325	-2205	-188	-716	-2141	-24205	-2646	-36426
Western Surplus	424	2509	-255	603	-628	-1219	-3488	-2054
Bina Production Likely Movement	140	677	86	62	1035	1583	1067	4648
(a) Madhya Pradesh	140	164	86	39	294	1255	57	2034
(b) Eastern Region	0	513	0	22	741	328	1010	2614
W Surplus excluding (b)	424	1996	-255	581	-1369	-1547	-4499	-4669
Northern Supply								
-via KB Pipeline		1996		581				2577
-via Jamnagar-Loni Pipeline	424							424
Total Supply	424	1996	0	581	0	0	0	3000
Residual Deficit	-3901	-209	-188	-135	-2141	-24205	-2646	-33426

* Reflects the sum of the listed seven products only

Again, as in the base case, the capacities of the Kandla-Bathinda & Jamnagar-Loni pipelines remain largely unutilised. The net deficit of 33.4 MMT in the northern region can be met through additional refining capacity in the north and by imports utilising the unused capacities of the Kandla-Bathinda and Jamnagar-Loni pipelines.

Conclusions

Based on the above mentioned, residual deficits in the country and the northern region, under the two scenarios, are presented in Table 4.18.

Table 4.18 Residual deficits in the country and the northern region: Base & Alternate cases (MMT)

Year	All India			Northern Region			
	Demand	Supply	Deficit	Demand	Supply	Deficit	Residual Deficit
Base Case							
1999/00	94.0	72.7	-18.2	22.5	10.7	-11.8	-7.7
2000/01	100.3	88.7	-11.6	24.2	11.3	-12.8	-5.1
2001/02	108.1	89.0	-19.2	25.9	11.4	-14.5	-7.2
2002/03	117.6	95.0	-22.5	27.8	11.4	-16.4	-9.9
2003/04	127.1	97.3	-29.7	30.3	11.4	-18.9	-13.7
2004/05*	135.3	127.8	-7.5	32.5	16.3	-16.2	-6.5
2005/06	143.9	127.8	-16.2	34.8	16.3	-18.6	-10.1
2006/07	153.4	127.8	-25.7	37.4	16.3	-21.1	-14.1
2011/12	209.3	127.8	-81.5	52.7	16.3	-36.4	-34.6
Alternate case							
1999/00	94.0	72.7	-18.2	22.5	10.7	-11.8	-7.7
2000/01	100.3	88.7	-8.0	24.1	11.3	-12.8	-4.8

Year	All India			Northern Region			
	Demand	Supply	Deficit	Demand	Supply	Deficit	Residual Deficit
2001/02	108.1	89.0	-19.2	25.9	11.4	-14.5	-7.2
2002/03	117.6	99.6	-18.0	27.8	11.4	-16.4	-8.1
2003/04	127.1	101.9	-25.2	30.3	11.4	-18.9	-11.7
2004/05*$	135.3	136.6	1.4	32.5	16.3	-16.2	-2.6
2005/06	143.9	136.6	-7.4	34.8	16.3	-18.6	-6.1
2006/07#	153.4	139.2	-14.2	37.4	16.3	-21.1	-10.1
2011/12	209.3	139.2	-70.1	52.7	16.3	-36.4	-33.4

* Commissioning of refineries at Vadinar, Bina and Paradip; Expansion at Panipat

$ Expansion at BPC, Mumbai

Expansion at Haldia

Note: Demand, supply and deficit numbers are for the seven products considered in this analysis

It may be noted again that the above deficits have been estimated with refinery throughputs at 95% of the name plate capacities. Over the last few years, on account of a deficit situation, Indian refineries have been operating beyond their rated capacities. The above deficits may be met by higher utilisation of existing refineries, product imports at Kandla, and/or additional refining capacity.

At the design throughput of 9 MMT, the output of the above mentioned seven products from the Bathinda refinery adds up to 7.8 MMT (as given in DFR). Given the conservative deficit of 10.1 MMT by 2006/07 (Alternate Case), if the refinery is commissioned by 2006/07, the northern deficit would stand reduced to only 2.3 MMT. In such a scenario, this remaining deficit of 2.3 MMT would have to be met by additional imports at Kandla or through higher utilisation of existing refineries.

Annexure 4.1

Demand-supply balance and product flows: Base case - 1999/00 (TMT)

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Demand								
Northern Region	2080	1818	676	836	2424	12161	2554	22549
Southern Region	1756	1571	1805	415	2646	11437	3378	23008
Eastern Region	1239	830	1420	287	3719	8035	1521	17051
Western Region	2056	1710	3667	741	3683	11031	5392	28280
Total	**7131**	**5927**	**10717**	**2279**	**12471**	**42664**	**12846**	**94036**
Supply								
Northern Region	356	1419	612	693	1087	5304	1249	10721
Southern Region	671	2086	2295	533	1926	10354	3791	21655
Eastern Region	238	211	1246	247	653	4389	1242	8226
Western Region	3305	2612	4486	1185	2479	13335	4647	32049
Total	**4571**	**6328**	**8638**	**2658**	**6145**	**33382**	**10929**	**72651**
Deficit								
Northern Region	-1724	-399	-64	-143	-1336	-6856	-1305	-11827
Southern Region	-1085	515	490	118	-720	-1083	413	-1353
Eastern Region	-1001	-618	-174	-40	-3066	-3646	-279	-8825
Western Region	1249	902	819	444	-1204	2304	-746	3769
Total	**-2561**	**400**	**1070**	**379**	**-6326**	**-9282**	**-1917**	**-18236**
Imports/Exports								
Gross Exports		400	1070	379				1850
Gross Imports/ Domestic Production	-2561				-6326	-9282	-1917	-20086

State-wise Demand Supply Balance

Demand								
Punjab	319	416	58	69	429	2538	1026	4854
Haryana	244	187	0	27	211	1975	549	3192
Delhi	553	556	0	602	274	1376	122	3484
Rajasthan	285	253	313	50	521	2957	345	4724
Jammu & Kashmir	67	63	0	20	161	252	25	588
Himachal Pradesh	70	36	0	0	60	272	28	465
Chandigarh	35	60	0	28	22	81	22	250
Uttar Pradesh-West	507	247	305	40	745	2710	437	4992
Total	2080	1818	676	836	2424	12161	2554	22549
Supply								
Haryana	105	506	128	139	463	1843	359	3543
Uttar Pradesh-West	251	913	484	554	624	3461	890	7178
Total	356	1419	612	693	1087	5304	1249	10721
Deficit								
Punjab	-319	-416	-58	-69	-429	-2538	-1026	-4854
Haryana	-139	319	128	112	253	-132	-190	351
Delhi	-553	-556	0	-602	-274	-1376	-122	-3484
Rajasthan	-285	-253	-313	-50	-521	-2957	-345	-4724
Jammu & Kashmir	-67	-63	0	-20	-161	-252	-25	-588

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Himachal Pradesh	-70	-36	0	0	-60	-272	-28	-465
Chandigarh	-35	-60	0	-28	-22	-81	-22	-250
Uttar Pradesh	-255	665	178	514	-121	752	453	2186
Total	-1724	-399	-64	-143	-1336	-6856	-1305	-11827
Product Flows: Northern Region								
Western Surplus	1249	902	819	444	-1204	2304	-746	3769
Northern Supply								
-via KB Pipeline		399	64	143		2304		2910
-via Rail/Road	1249							1249
Total	1249	399	64	143	0	2304	0	4159
Residual Deficit	-475	0	0	0	-1336	-4552	-1305	-7668

Annexure 4.2

Demand-supply balance and product flows: Base case - 2000/01 (TMT)

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Demand								
Northern Region	2264	1957	697	882	2500	13192	2660	24151
Southern Region	1912	1690	1859	438	2729	12407	3518	24554
Eastern Region	1349	893	1863	302	3837	8716	1584	18545
Western Region	2238	1840	6823	782	3799	11967	5616	33065
Total	7763	6380	11242	2404	12866	46282	13378	100315
Supply								
Northern Region	519	1495	600	677	1183	5565	1273	11313
Southern Region	796	2735	2584	537	2504	12772	4628	26556
Eastern Region	339	190	1528	309	1709	5575	1166	10816
Western Region	4357	3857	5313	1111	3450	17532	4375	39995
Total	6012	8277	10025	2634	8846	41443	11443	88680
Deficit								
Northern Region	-1745	-461	-96	-205	-1317	-7627	-1387	-12839
Southern Region	-1116	1044	725	99	-225	365	1110	2002
Eastern Region	-1009	-703	-335	7	-2128	-3142	-418	-7728
Western Region	2119	2017	-1510	329	-349	5565	-1240	6930
Total	-1751	1897	-1216	230	-4020	-4839	-1935	-11635
Imports/Exports								
Gross Exports		1897		230				2127
Gross Imports/ Domestic Production	-1751		-1216		-4020	-4839	-1935	-13761
State-wise Demand Supply Balance								
Demand								
Punjab	347	447	59	73	443	2753	1068	5191
Haryana	266	201	0	29	217	2142	571	3426
Delhi	602	599	0	634	283	1493	128	3739
Rajasthan	310	272	323	53	538	3208	359	5062
Jammu & Kashmir	73	68	0	21	166	273	26	627
Himachal Pradesh	76	38	0	0	62	295	29	500
Chandigarh	38	65	0	30	23	88	23	267
Uttar Pradesh-West	552	266	315	43	769	2939	455	5338
Total	2264	1957	697	882	2500	13192	2660	24151
Supply								
Haryana	144	695	176	191	636	2530	493	4863
Uttar Pradesh-West	375	801	424	486	547	3035	780	6449
Total	519	1495	600	677	1183	5565	1273	11313
Deficit								
Punjab	-347	-447	-59	-73	-443	-2753	-1068	-5191
Haryana	-122	494	176	162	419	387	-79	1437
Delhi	-602	-599	0	-634	-283	-1493	-128	-3739
Rajasthan	-310	-272	-323	-53	-538	-3208	-359	-5062
Jammu & Kashmir	-73	-68	0	-21	-166	-273	-26	-627

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Himachal Pradesh	-76	-38	0	0	-62	-295	-29	-500
Chandigarh	-38	-65	0	-30	-23	-88	-23	-267
Uttar Pradesh	-176	534	110	444	-221	96	325	1111
Total	-1745	-461	-96	-205	-1317	-7627	-1387	-12839
Product Flows: Northern Region								
Western Surplus	2119	2017	-1510	329	-349	5565	-1240	6930
Northern Supply								
-via KB Pipeline		461		205		5334	0	6000
-via Rail/Road	1745							1745
Total	1745	461	0	205	0	5334	0	7745
Residual Deficit	0	0	-96	0	-1317	-2293	-1387	-5094

Annexure 4.3

Demand-supply balance and product flows: Base case - 2002/03 (TMT)

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Demand								
Northern Region	2641	2267	739	980	2736	15524	2896	27783
Southern Region	2230	1958	1972	487	2987	14601	4697	28932
Eastern Region	1573	1035	3052	336	4199	10258	1725	22177
Western Region	2611	2132	7053	869	4158	14082	7769	38674
Total	9054	7392	12817	2672	14080	54465	17087	117566
Supply								
Northern Region	596	1495	600	677	1183	5565	1273	11390
Southern Region	1022	3435	2846	1021	3104	15022	4861	31311
Eastern Region	375	190	1793	309	1846	6356	1235	12105
Western Region	4584	3857	5313	1111	3450	17532	4375	40222
Total	6577	8977	10552	3118	9584	44474	11745	95028
Deficit								
Northern Region	-2045	-771	-139	-303	-1553	-9960	-1623	-16393
Southern Region	-1208	1477	874	534	117	420	164	2379
Eastern Region	-1198	-844	-1259	-27	-2353	-3901	-490	-10071
Western Region	1973	1725	-1740	242	-708	3449	-3394	1548
Total	-2476	1586	-2264	446	-4496	-9991	-5342	-22538
Imports/Exports								
Gross Exports		1586		446				2032
Gross Imports/ Domestic Production	-2476		-2264		-4496	-9991	-5342	-24570
State-wise Demand Supply Balance								
Demand								
Punjab	405	518	63	81	485	3240	1163	5954
Haryana	310	233	0	32	238	2521	622	3956
Delhi	703	694	0	705	309	1756	139	4306
Rajasthan	362	315	342	59	588	3775	391	5832
Jammu & Kashmir	85	79	0	23	182	322	28	719
Himachal Pradesh	89	44	0	0	68	348	31	580
Chandigarh	45	75	0	33	25	104	25	307
Uttar Pradesh-West	643	309	334	47	841	3459	496	6129
Total	2641	2267	739	980	2736	15524	2896	27783
Supply								
Haryana	144	695	176	191	636	2530	493	4863
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	596	1495	600	677	1183	5565	1273	11390
Deficit								
Punjab	-405	-518	-63	-81	-485	-3240	-1163	-5954
Haryana	-166	462	176	159	398	9	-129	908
Delhi	-703	-694	0	-705	-309	-1756	-139	-4306
Rajasthan	-362	-315	-342	-59	-588	-3775	-391	-5832
Jammu & Kashmir	-85	-79	0	-23	-182	-322	-28	-719

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Himachal Pradesh	-89	-44	0	0	-68	-348	-31	-580
Chandigarh	-45	-75	0	-33	-25	-104	-25	-307
Uttar Pradesh	-191	492	90	439	-294	-424	285	397
Total	-2045	-771	-139	-303	-1553	-9960	-1623	-16393

Product Flows: Northern Region

Western Surplus	1973	1725	-1740	242	-708	3449	-3394	1548
Northern Supply								
-via KB Pipeline		771		242		3449		4462
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	345							345
Total	2045	771	0	242	0	3449	0	6162
Residual Deficit	0	0	-139	-61	-1553	-6510	-1623	-9886

Annexure 4.4

Demand-supply balance and product flows: Base case - 2003/04 (TMT)

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Demand								
Northern Region	2841	2440	761	1034	2859	16841	3506	30283
Southern Region	2399	2108	2031	513	3121	15839	6454	32466
Eastern Region	1692	1114	3098	354	4388	11128	1806	23580
Western Region	2809	2295	6251	916	4345	15277	8845	40737
Total	9742	7956	12142	2818	14714	59085	20611	127067
Supply								
Northern Region	596	1495	600	677	1183	5565	1273	11390
Southern Region	1079	3584	3164	1202	3296	15959	5321	33604
Eastern Region	375	190	1793	309	1846	6356	1235	12105
Western Region	4584	3857	5313	1111	3450	17532	4375	40222
Total	6634	9126	10871	3299	9776	45411	12205	97322
Deficit								
Northern Region	-2245	-944	-161	-357	-1676	-11276	-2233	-18893
Southern Region	-1320	1476	1133	688	175	119	-1133	1138
Eastern Region	-1317	-923	-1305	-45	-2542	-4771	-571	-11475
Western Region	1775	1562	-938	195	-895	2255	-4469	-515
Total	-3107	1171	-1272	481	-4938	-13673	-8406	-29745
Imports/Exports								
Gross Exports		668		481				1149
Gross Imports/ Domestic Production	-3107		-1272		-4938	-13673	-8406	-31396

State-wise Demand Supply Balance

	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Demand								
Punjab	435	558	65	85	507	3515	1692	6857
Haryana	333	251	0	34	249	2735	651	4252
Delhi	756	747	0	744	323	1905	145	4621
Rajasthan	389	339	353	62	615	4095	409	6262
Jammu & Kashmir	91	85	0	24	190	349	30	769
Himachal Pradesh	96	48	0	0	71	377	33	624
Chandigarh	48	80	0	35	26	113	27	329
Uttar Pradesh-West	692	332	344	50	879	3752	519	6568
Total	2841	2440	761	1034	2859	16841	3506	30283
Supply								
Haryana	144	695	176	191	636	2530	493	4863
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	596	1495	600	677	1183	5565	1273	11390
Deficit								
Punjab	-435	-558	-65	-85	-507	-3515	-1692	-6857
Haryana	-190	444	176	157	387	-205	-158	611
Delhi	-756	-747	0	-744	-323	-1905	-145	-4621
Rajasthan	-389	-339	-353	-62	-615	-4095	-409	-6262
Jammu & Kashmir	-91	-85	0	-24	-190	-349	-30	-769

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Himachal Pradesh	-96	-48	0	0	-71	-377	-33	-624
Chandigarh	-48	-80	0	-35	-26	-113	-27	-329
Uttar Pradesh	-240	468	80	436	-332	-717	261	-42
Total	-2245	-944	-161	-357	-1676	-11276	-2233	-18893
Product Flows: Northern Region								
Western Surplus	1775	1562	-938	195	-895	2255	-4469	-515
Northern Supply								
-via KB Pipeline		944		195		2255		3394
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	75							75
Total	1775	944	0	195	0	2255	0	5169
Residual Deficit	-470	0	-161	-162	-1676	-9021	-2233	-13724

Annexure 4.5

Demand-supply balance and product flows: Base case - 2004/05 (TMT)

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Demand								
Northern Region	3076	2626	784	1090	2987	18269	3649	32481
Southern Region	2597	2269	2092	541	3260	17183	6642	34585
Eastern Region	1832	1199	3146	374	4583	12071	1891	25096
Western Region	3041	2470	6375	966	4538	16572	9146	43109
Total	10548	8563	12398	2972	15368	64095	21328	135272
Supply								
Northern Region	740	2190	776	867	1819	8094	1766	16253
Southern Region	1279	4116	3672	1263	3604	18729	6107	38770
Eastern Region	708	618	2312	309	3682	10754	1235	19618
Western Region	5185	6097	5574	1648	4674	24419	5571	53168
Total	7912	13021	12335	4088	13779	61996	14679	127809
Deficit								
Northern Region	-2337	-436	-8	-223	-1168	-10175	-1883	-16228
Southern Region	-1318	1847	1580	722	344	1546	-536	4185
Eastern Region	-1125	-581	-834	-65	-901	-1317	-656	-5478
Western Region	2143	3627	-801	681	136	7847	-3575	10059
Total	-2636	4457	-63	1116	-1589	-2099	-6649	-7463
Imports/Exports								
Gross Exports		4457		1116				5573
Gross Imports/ Domestic Production	-2636		-63		-1589	-2099	-6649	-13036

State-wise Demand Supply Balance

	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Demand								
Punjab	471	600	67	90	529	3813	1749	7320
Haryana	361	270	0	35	260	2967	682	4575
Delhi	819	804	0	784	338	2067	152	4964
Rajasthan	422	365	363	65	642	4442	429	6728
Jammu & Kashmir	99	91	0	25	198	379	31	824
Himachal Pradesh	103	51	0	0	74	409	34	672
Chandigarh	52	87	0	37	28	122	28	353
Uttar Pradesh-West	750	357	354	53	918	4071	543	7046
Total	3076	2626	784	1090	2987	18269	3649	32481
Supply								
Haryana	288	1390	352	381	1272	5059	985	9727
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	740	2190	776	867	1819	8094	1766	16253
Deficit								
Punjab	-471	-600	-67	-90	-529	-3813	-1749	-7320
Haryana	-73	1119	352	346	1012	2092	304	5152
Delhi	-819	-804	0	-784	-338	-2067	-152	-4964
Rajasthan	-422	-365	-363	-65	-642	-4442	-429	-6728
Jammu & Kashmir	-99	-91	0	-25	-198	-379	-31	-824

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Himachal Pradesh	-103	-51	0	0	-74	-409	-34	-672
Chandigarh	-52	-87	0	-37	-28	-122	-28	-353
Uttar Pradesh	-297	443	70	434	-371	-1035	237	-520
Total	-2337	-436	-8	-223	-1168	-10175	-1883	-16228

Product Flows: Northern Region

Western Surplus	2143	3627	-801	681	136	7847	-3575	10059
Bina Production Likely Movement	140	677	86	62	1035	1583	1067	4648
(a) Madhya Pradesh	118	98	86	27	221	710	48	1308
(b) Eastern Region	22	579	0	35	813	873	1019	3341
W Surplus excluding (b)	2121	3048	-801	647	-677	6974	-4594	6719
Northern Supply								
-via KB Pipeline		436		223		6974	0	7633
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	421							421
Total	2121	436	0	223	0	6974	0	9754
Residual Deficit	-215	0	-8	0	-1168	-3201	-1883	-6474

Annexure 4.6

Demand-supply balance and product flows: Base case - 2005/06 (TMT)

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Demand								
Northern Region	3290	2827	808	1150	3118	19819	3798	34809
Southern Region	2778	2442	2155	571	3403	18640	6840	36829
Eastern Region	1960	1290	3196	394	4784	13095	1980	26699
Western Region	3253	2658	6502	1019	4737	17978	9461	45609
Total	**11281**	**9217**	**12661**	**3134**	**16042**	**69531**	**22078**	**143945**
Supply								
Northern Region	740	2190	776	867	1819	8094	1766	16253
Southern Region	1279	4116	3672	1263	3604	18729	6107	38770
Eastern Region	708	618	2312	309	3682	10754	1235	19618
Western Region	5149	6097	5574	1648	4674	24419	5571	53132
Total	**7876**	**13021**	**12335**	**4088**	**13779**	**61996**	**14679**	**127773**
Deficit								
Northern Region	-2550	-636	-31	-282	-1299	-11724	-2032	-18555
Southern Region	-1499	1674	1517	692	201	89	-733	1941
Eastern Region	-1252	-672	-884	-85	-1102	-2341	-744	-7081
Western Region	1896	3439	-928	628	-63	6441	-3890	7523
Total	**-3406**	**3803**	**-326**	**954**	**-2263**	**-7535**	**-7399**	**-16172**
Imports/Exports								
Gross Exports		3803		954				4757
Gross Imports/ Domestic Production	-3406		-326		-2263	-7535	-7399	-20929

State-wise Demand Supply Balance

Demand								
Punjab	504	646	69	95	552	4136	1809	7812
Haryana	386	291	0	37	271	3218	714	4917
Delhi	876	865	0	827	352	2242	159	5322
Rajasthan	451	393	374	69	670	4819	449	7225
Jammu & Kashmir	106	98	0	27	207	411	33	882
Himachal Pradesh	111	55	0	0	77	444	36	723
Chandigarh	56	93	0	39	29	133	29	378
Uttar Pradesh-West	802	385	365	55	958	4416	569	7550
Total	**3290**	**2827**	**808**	**1150**	**3118**	**19819**	**3798**	**34809**
Supply								
Haryana	288	1390	352	381	1272	5059	985	9727
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	**740**	**2190**	**776**	**867**	**1819**	**8094**	**1766**	**16253**
Deficit								
Punjab	-504	-646	-69	-95	-552	-4136	-1809	-7812
Haryana	-99	1099	352	344	1001	1841	272	4809
Delhi	-876	-865	0	-827	-352	-2242	-159	-5322
Rajasthan	-451	-393	-374	-69	-670	-4819	-449	-7225
Jammu & Kashmir	-106	-98	0	-27	-207	-411	-33	-882
Himachal Pradesh	-111	-55	0	0	-77	-444	-36	-723
Chandigarh	-56	-93	0	-39	-29	-133	-29	-378

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Uttar Pradesh	-349	416	59	431	-411	-1381	211	-1024
Total	-2550	-636	-31	-282	-1299	-11724	-2032	-18555

Product Flows: Northern Region

Western Surplus	1896	3439	-928	628	-63	6441	-3890	7523
Bina Production Likely Movement	140	677	86	62	1035	1583	1067	4648
(a) Madhya Pradesh	126	106	86	29	231	770	50	1397
(b) Eastern Region	14	572	0	33	803	813	1017	3252
W Surplus excluding (b)	1882	2867	-928	595	-867	5629	-4907	4272
Northern Supply								
-via KB Pipeline		636		282		5629		6547
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	182							182
Total	1882	636	0	282	0	5629	0	8429
Residual Deficit	-668	0	-31	0	-1299	-6095	-2032	-10127

Annexure 4.7

Demand-supply balance and product flows: Alternate case - 1999/00 (TMT)

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Demand								
Northern Region	2080	1818	676	836	2424	12161	2554	22549
Southern Region	1756	1571	1805	415	2646	11437	3378	23008
Eastern Region	1239	830	1420	287	3719	8035	1521	17051
Western Region	2056	1710	3667	741	3683	11031	5392	28280
Total	7131	5927	10717	2279	12471	42664	12846	94036
Supply								
Northern Region	356	1419	612	693	1087	5304	1249	10721
Southern Region	671	2086	2295	533	1926	10354	3791	21655
Eastern Region	238	211	1246	247	653	4389	1242	8226
Western Region	3305	2612	4486	1185	2479	13335	4647	32049
Total	4571	6328	8638	2658	6145	33382	10929	72651
Deficit								
Northern Region	-1724	-399	-64	-143	-1336	-6856	-1305	-11827
Southern Region	-1085	515	490	118	-720	-1083	413	-1353
Eastern Region	-1001	-618	-174	-40	-3066	-3646	-279	-8825
Western Region	1249	902	819	444	-1204	2304	-746	3769
Total	-2561	400	1070	379	-6326	-9282	-1917	-18236
Imports/Exports								
Gross Exports		400	1070	379				1850
Gross Imports/ Domestic Production	-2561				-6326	-9282	-1917	-20086

State-wise Demand Supply Balance

	LPG	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Demand								
Punjab	319	416	58	69	429	2538	1026	4854
Haryana	244	187	0	27	211	1975	549	3192
Delhi	553	556	0	602	274	1376	122	3484
Rajasthan	285	253	313	50	521	2957	345	4724
Jammu & Kashmir	67	63	0	20	161	252	25	588
Himachal Pradesh	70	36	0	0	60	272	28	465
Chandigarh	35	60	0	28	22	81	22	250
Uttar Pradesh-West	507	247	305	40	745	2710	437	4992
Total	2080	1818	676	836	2424	12161	2554	22549
Supply								
Haryana	105	506	128	139	463	1843	359	3543
Uttar Pradesh-West	251	913	484	554	624	3461	890	7178
Total	356	1419	612	693	1087	5304	1249	10721
Deficit								
Punjab	-319	-416	-58	-69	-429	-2538	-1026	-4854
Haryana	-139	319	128	112	253	-132	-190	351
Delhi	-553	-556	0	-602	-274	-1376	-122	-3484
Rajasthan	-285	-253	-313	-50	-521	-2957	-345	-4724
Jammu & Kashmir	-67	-63	0	-20	-161	-252	-25	-588

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Himachal Pradesh	-70	-36	0	0	-60	-272	-28	-465
Chandigarh	-35	-60	0	-28	-22	-81	-22	-250
Uttar Pradesh	-255	665	178	514	-121	752	453	2186
Total	**-1724**	**-399**	**-64**	-143	-1336	-6856	-1305	-11827

Product Flows: Northern Region

Western Surplus	**1249**	**902**	**819**	444	-1204	2304	-746	3769
Northern Supply								
-via KB Pipeline		399	64	143		2304	0	2910
-via Rail/Road	1249							1249
Total	1249	399	64	143	0	2304	0	4159
Residual Deficit	-475	0	0	0	-1336	-4552	-1305	-7668

Annexure 4.8

Demand-supply balance and product flows: Alternate case - 2000/01 (TMT)

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Demand								
Northern Region	2264	1957	676	882	2500	13192	2660	24131
Southern Region	1912	1690	1805	438	2729	12407	3518	24500
Eastern Region	1349	893	1420	302	3837	8716	1584	18102
Western Region	2238	1840	3667	782	3799	11967	5616	29908
Total	7763	6380	11242	2404	12866	46282	13378	100315
Supply								
Northern Region	519	1495	600	677	1183	5565	1273	11313
Southern Region	796	2735	2584	537	2504	12772	4628	26556
Eastern Region	339	190	1528	309	1709	5575	1166	10816
Western Region	4357	3857	5313	1111	3450	17532	4375	39995
Total	6012	8277	10025	2634	8846	41443	11443	88680
Deficit								
Northern Region	-1745	-461	-76	-205	-1317	-7627	-1387	-12818
Southern Region	-1116	1044	779	99	-225	365	1110	2056
Eastern Region	-1009	-703	108	7	-2128	-3142	-418	-7286
Western Region	2119	2017	1647	329	-349	5565	-1240	10087
Total	-1751	1897	2457	230	-4020	-4839	-1935	-7961
Imports/Exports								
Gross Exports		1897	2457	230				4584
Gross Imports/ Domestic Production	-1751				-4020	-4839	-1935	-12545

State-wise Demand Supply Balance

	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Demand								
Punjab	347	447	58	73	443	2753	1068	4541
Haryana	266	201	0	29	217	2142	571	3188
Delhi	602	599	0	634	283	1493	128	3863
Rajasthan	310	272	313	53	538	3208	359	4762
Jammu & Kashmir	73	68	0	21	166	273	26	1039
Himachal Pradesh	76	38	0	0	62	295	29	555
Chandigarh	38	65	0	30	23	88	23	350
Uttar Pradesh-West	552	266	305	43	769	2939	455	5834
Total	2264	1957	676	882	2500	13192	2660	24131
Supply								
Haryana	144	695	176	191	636	2530	493	4863
Uttar Pradesh-West	375	801	424	486	547	3035	780	6449
Total	519	1495	600	677	1183	5565	1273	11313
Deficit								
Punjab	-347	-447	-58	-73	-443	-2753	-1068	-5189
Haryana	-122	494	176	162	419	387	-79	1437
Delhi	-602	-599	0	-634	-283	-1493	-128	-3739
Rajasthan	-310	-272	-313	-53	-538	-3208	-359	-5053
Jammu & Kashmir	-73	-68	0	-21	-166	-273	-26	-627

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Himachal Pradesh	-76	-38	0	0	-62	-295	-29	-500
Chandigarh	-38	-65	0	-30	-23	-88	-23	-267
Uttar Pradesh	-176	534	119	444	-221	96	325	1120
Total	-1745	-461	-76	-205	-1317	-7627	-1387	-12818

Product Flows: Northern Region

Western Surplus	**2119**	**2017**	1647	329	-349	5565	-1240	10087
Northern Supply								
-via KB Pipeline		461	76	205		5258	0	6000
-via Rail/Road	1745					307		2052
Total	1745	461	76	205	0	5565	0	8052
Residual Deficit	0	0	0	0	-1317	-2062	-1387	-4766

Annexure 4.9

Demand-supply balance and product flows: Alternate case – 2002/03 (TMT)

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Demand								
Northern Region	2641	2267	739	980	2736	15524	2896	27783
Southern Region	2230	1958	1972	487	2987	14601	4697	28932
Eastern Region	1573	1035	3052	336	4199	10258	1725	22177
Western Region	2611	2132	7053	869	4158	14082	7769	38674
Total	9054	7392	12817	2672	14080	54465	17087	117566
Supply								
Northern Region	596	1495	600	677	1183	5565	1273	11390
Southern Region	1022	3435	2846	1021	3104	15022	4861	31311
Eastern Region	375	190	1793	309	1846	6356	1235	12105
Western Region	4726	3954	6065	1331	3917	19262	5501	44755
Total	6719	9075	11304	3338	10050	46204	12870	99561
Deficit								
Northern Region	-2045	-771	-139	-303	-1553	-9960	-1623	-16393
Southern Region	-1208	1477	874	534	117	420	164	2379
Eastern Region	-1198	-844	-1259	-27	-2353	-3901	-490	-10071
Western Region	2115	1823	-988	462	-241	5179	-2269	6081
Total	-2335	1684	-1512	666	-4029	-8261	-4217	-18005
Imports/Exports								
Gross Exports		1684		666				2349
Gross Imports/ Domestic Production	-2335		-1512		-4029	-8261	-4217	-20354

State-wise Demand Supply Balance

Demand								
Punjab	405	518	63	81	485	3240	1163	5954
Haryana	310	233	0	32	238	2521	622	3956
Delhi	703	694	0	705	309	1756	139	4306
Rajasthan	362	315	342	59	588	3775	391	5832
Jammu & Kashmir	85	79	0	23	182	322	28	719
Himachal Pradesh	89	44	0	0	68	348	31	580
Chandigarh	45	75	0	33	25	104	25	307
Uttar Pradesh-West	643	309	334	47	841	3459	496	6129
Total	2641	2267	739	980	2736	15524	2896	27783
Supply								
Haryana	144	695	176	191	636	2530	493	4863
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	596	1495	600	677	1183	5565	1273	11390
Deficit								
Punjab	-405	-518	-63	-81	-485	-3240	-1163	-5954
Haryana	-166	462	176	159	398	9	-129	908
Delhi	-703	-694	0	-705	-309	-1756	-139	-4306
Rajasthan	-362	-315	-342	-59	-588	-3775	-391	-5832
Jammu & Kashmir	-85	-79	0	-23	-182	-322	-28	-719

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Himachal Pradesh	-89	-44	0	0	-68	-348	-31	-580
Chandigarh	-45	-75	0	-33	-25	-104	-25	-307
Uttar Pradesh	-191	492	90	439	-294	-424	285	397
Total	-2045	-771	-139	-303	-1553	-9960	-1623	-16393
Product Flows: Northern Region								
Western Surplus	2115	1823	-988	462	-241	5179	-2269	6081
Northern Supply								
-via KB Pipeline		771		303		4926		6000
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	345					253		598
Total	2045	771	0	303	0	5179	0	8298
Residual Deficit	0	0	-139	0	-1553	-4780	-1623	-8095

Annexure 4.10

Demand-supply balance and product flows: Alternate case - 2003/04 (TMT)

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Demand								
Northern Region	2841	2440	761	1034	2859	16841	3506	30283
Southern Region	2399	2108	2031	513	3121	15839	6454	32466
Eastern Region	1692	1114	3098	354	4388	11128	1806	23580
Western Region	2809	2295	6251	916	4345	15277	8845	40737
Total	9742	7956	12142	2818	14714	59085	20611	127067
Supply								
Northern Region	596	1495	600	677	1183	5565	1273	11390
Southern Region	1079	3584	3164	1202	3296	15959	5321	33604
Eastern Region	375	190	1793	309	1846	6356	1235	12105
Western Region	4726	3954	6065	1331	3917	19262	5501	44755
Total	6776	9224	11623	3519	10242	47141	13330	101854
Deficit								
Northern Region	-2245	-944	-161	-357	-1676	-11276	-2233	-18893
Southern Region	-1320	1476	1133	688	175	119	-1133	1138
Eastern Region	-1317	-923	-1305	-45	-2542	-4771	-571	-11475
Western Region	1917	1660	-186	414	-428	3985	-3344	4017
Total	-2966	1268	-520	701	-4472	-11943	-7281	-25212
Imports/Exports								
Gross Exports		1268		701				1969
Gross Imports/ Domestic Production	-2966		-520		-4472	-11943	-7281	-27181

State-wise Demand Supply Balance

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Demand								
Punjab	435	558	65	85	507	3515	1692	6857
Haryana	333	251	0	34	249	2735	651	4252
Delhi	756	747	0	744	323	1905	145	4621
Rajasthan	389	339	353	62	615	4095	409	6262
Jammu & Kashmir	91	85	0	24	190	349	30	769
Himachal Pradesh	96	48	0	0	71	377	33	624
Chandigarh	48	80	0	35	26	113	27	329
Uttar Pradesh-West	692	332	344	50	879	3752	519	6568
Total	2841	2440	761	1034	2859	16841	3506	30283
Supply								
Haryana	144	695	176	191	636	2530	493	4863
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	596	1495	600	677	1183	5565	1273	11390
Deficit								
Punjab	-435	-558	-65	-85	-507	-3515	-1692	-6857
Haryana	-190	444	176	157	387	-205	-158	611
Delhi	-756	-747	0	-744	-323	-1905	-145	-4621
Rajasthan	-389	-339	-353	-62	-615	-4095	-409	-6262
Jammu & Kashmir	-91	-85	0	-24	-190	-349	-30	-769

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Himachal Pradesh	-96	-48	0	0	-71	-377	-33	-624
Chandigarh	-48	-80	0	-35	-26	-113	-27	-329
Uttar Pradesh	-240	468	80	436	-332	-717	261	-42
Total	-2245	-944	-161	-357	-1676	-11276	-2233	-18893

Product Flows: Northern Region

Western Surplus	1917	1660	-186	414	-428	3985	-3344	4017
Northern Supply								
-via KB Pipeline		944		357		3985		5286
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	217							217
Total	1917	944	0	357	0	3985	0	6986
Residual Deficit	-328	0	-161	0	-1676	-7291	-2233	-11690

Annexure 4.11

Demand-supply balance and product flows: Alternate case - 2004/05 (TMT)

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Demand								
Northern Region	3076	2626	784	1090	2987	18269	3649	32481
Southern Region	2597	2269	2092	541	3260	17183	6642	34585
Eastern Region	1832	1199	3146	374	4583	12071	1891	25096
Western Region	3041	2470	6375	966	4538	16572	9146	43109
Total	10548	8563	12398	2972	15368	64095	21328	135272
Supply								
Northern Region	740	2190	776	867	1819	8094	1766	16253
Southern Region	1279	4116	3672	1263	3604	18729	6107	38770
Eastern Region	708	618	2312	309	3682	10754	1235	19618
Western Region	5497	6643	7097	2007	5390	28080	7268	61981
Total	8224	13566	13857	4447	14495	65657	16376	136622
Deficit								
Northern Region	-2337	-436	-8	-223	-1168	-10175	-1883	-16228
Southern Region	-1318	1847	1580	722	344	1546	-536	4185
Eastern Region	-1125	-581	-834	-65	-901	-1317	-656	-5478
Western Region	2456	4173	722	1040	852	11508	-1878	18872
Total	-2324	5003	1460	1475	-873	1562	-4952	1350
Imports/Exports								
Gross Exports		5003	1460	1475		1562		9499
Gross Imports/ Domestic Production	-2324				-873		-4952	-8149

State-wise Demand Supply Balance

	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Demand								
Punjab	471	600	67	90	529	3813	1749	7320
Haryana	361	270	0	35	260	2967	682	4575
Delhi	819	804	0	784	338	2067	152	4964
Rajasthan	422	365	363	65	642	4442	429	6728
Jammu & Kashmir	99	91	0	25	198	379	31	824
Himachal Pradesh	103	51	0	0	74	409	34	672
Chandigarh	52	87	0	37	28	122	28	353
Uttar Pradesh-West	750	357	354	53	918	4071	543	7046
Total	3076	2626	784	1090	2987	18269	3649	32481
Supply								
Haryana	288	1390	352	381	1272	5059	985	9727
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	740	2190	776	867	1819	8094	1766	16253
Deficit								
Punjab	-471	-600	-67	-90	-529	-3813	-1749	-7320
Haryana	-73	1119	352	346	1012	2092	304	5152
Delhi	-819	-804	0	-784	-338	-2067	-152	-4964
Rajasthan	-422	-365	-363	-65	-642	-4442	-429	-6728
Jammu & Kashmir	-99	-91	0	-25	-198	-379	-31	-824

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Himachal Pradesh	-103	-51	0	0	-74	-409	-34	-672
Chandigarh	-52	-87	0	-37	-28	-122	-28	-353
Uttar Pradesh	-297	443	70	434	-371	-1035	237	-520
Total	-2337	-436	-8	-223	-1168	-10175	-1883	-16228

Product Flows: Northern Region

	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Western Surplus	2456	4173	722	1040	852	11508	-1878	18872
Bina Production Likely Movement	140	677	86	62	1035	1583	1067	4648
(a) Madhya Pradesh	118	98	86	27	221	710	48	1308
(b) Eastern Region	22	579	0	35	813	873	1019	3341
W Surplus excluding (b)	2434	3594	722	1006	39	10635	-2897	15532
Northern Supply								
-via KB Pipeline		436	8	223	39	10635		11341
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	637							637
Total	2337	436	8	223	39	10635	0	13678
Residual Deficit	0	0	0	0	-1129	460	-1883	-2550

Annexure 4.12

Demand-supply balance and product flows: Alternate case - 2005/06 (TMT)

Region	*LPG*	*MS*	*Naphtha*	*ATF*	*SKO*	*HSD*	*FO/LSHS*	*Total*
Demand								
Northern Region	3290	2827	808	1150	3118	19819	3798	34809
Southern Region	2778	2442	2155	571	3403	18640	6840	36829
Eastern Region	1960	1290	3196	394	4784	13095	1980	26699
Western Region	3253	2658	6502	1019	4737	17978	9461	45609
Total	11281	9217	12661	3134	16042	69531	22078	143945
Supply								
Northern Region	740	2190	776	867	1819	8094	1766	16253
Southern Region	1279	4116	3672	1263	3604	18729	6107	38770
Eastern Region	708	618	2312	309	3682	10754	1235	19618
Western Region	5461	6643	7097	2007	5390	28080	7268	61945
Total	8188	13566	13857	4447	14495	65657	16376	136586
Deficit								
Northern Region	-2550	-636	-31	-282	-1299	-11724	-2032	-18555
Southern Region	-1499	1674	1517	692	201	89	-733	1941
Eastern Region	-1252	-672	-884	-85	-1102	-2341	-744	-7081
Western Region	2208	3985	594	987	653	10102	-2193	16337
Total	-3093	4349	1197	1313	-1547	-3874	-5703	-7359
Imports/Exports								
Gross Exports		4349	1197	1313				6858
Gross Imports/ Domestic Production	-3093				-1547	-3874	-5703	-14217

State-wise Demand Supply Balance

Demand								
Punjab	504	646	69	95	552	4136	1809	7812
Haryana	386	291	0	37	271	3218	714	4917
Delhi	876	865	0	827	352	2242	159	5322
Rajasthan	451	393	374	69	670	4819	449	7225
Jammu & Kashmir	106	98	0	27	207	411	33	882
Himachal Pradesh	111	55	0	0	77	444	36	723
Chandigarh	56	93	0	39	29	133	29	378
Uttar Pradesh-West	802	385	365	55	958	4416	569	7550
Total	3290	2827	808	1150	3118	19819	3798	34809
Supply								
Haryana	288	1390	352	381	1272	5059	985	9727
Uttar Pradesh-West	452	801	424	486	547	3035	780	6526
Total	740	2190	776	867	1819	8094	1766	16253
Deficit								
Punjab	-504	-646	-69	-95	-552	-4136	-1809	-7812
Haryana	-99	1099	352	344	1001	1841	272	4809
Delhi	-876	-865	0	-827	-352	-2242	-159	-5322
Rajasthan	-451	-393	-374	-69	-670	-4819	-449	-7225
Jammu & Kashmir	-106	-98	0	-27	-207	-411	-33	-882

Region	LPG	MS	Naphtha	ATF	SKO	HSD	FO/LSHS	Total
Himachal Pradesh	-111	-55	0	0	-77	-444	-36	-723
Chandigarh	-56	-93	0	-39	-29	-133	-29	-378
Uttar Pradesh	-349	416	59	431	-411	-1381	211	-1024
Total	-2550	-636	-31	-282	-1299	-11724	-2032	-18555

Product Flows: Northern Region

Western Surplus	2208	3985	594	987	653	10102	-2193	16337
Bina Production Likely Movement	140	677	86	62	1035	1583	1067	4648
(a) Madhya Pradesh	126	106	86	29	231	770	50	1397
(b) Eastern Region	14	572	0	33	803	813	1017	3252
W Surplus excluding (b)	2194	3413	594	954	-151	9290	-3210	13085
Northern Supply								
-via KB Pipeline		636	31	282		9290	0	10239
-via Jamnagar-Loni Pipeline	1700							1700
-via Rail/Road	494							494
Total	2194	636	31	282	0	9290	0	12433
Residual Deficit	-356	0	0	0	-1299	-2435	-2032	-6123